RAILROAD GAZETTE

FRIDAY, AUGUST 21, 1896.

CONTENTS

ILLUSTRATIONS:	PAGE.
Diagrams with Report on Laboratory Tests of Brake Shoes	582
Plan of the Union Elevated Railroad (Downtown Loop), Chicago	585
Tower of the East River Bridge, New York	586
Plan of New Electric Railroad in Fairmount Park, Philadelphia	587
Upshur's Car Seat	588
The Improved Heilmann Locomotive	589
CONTRIBUTIONS:	
Coupler Repairs and the Maker's Rights	581
What are the Limits of Compressed Air Motors.	581
The Value of a Silver Dollar	581
EDITORIALS:	
July Earnings	590
A Presidential Candidate on Railroad Rates	590
July Accidents	590
Annual Report of Chicago & Northwestern	591
EDITORIAL NOTES	590, 591
New Publications	592
Trade Catalogues	591
GENERAL NEWS:	
Locomotive Building	593
Bridge Building	593
Meetings and Announcements	594
Personals	594
Elections and Appointments	595
Railroad Construction	595
Electric Railroad Construction	595
General Railroad News	596
Electric Railroad News	596
Traffic	596
MISCELLANEOUS:	
Technical	592
Past and Present Tendencies in Engineering Education	586
New Electric Road from Cleveland to Painesville	587
Notes on the Presidential Campaign	588
Eastern Association of Officers in Charge of Car Service	589
Train Accidents in July	589
Antofagasta & Bolivia Railroad	590

Contributions.

Coupler Repairs and the Maker's Rights.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The circular issued by the M. C. B. Association under date of Aug. 3, 1896, regarding the replacement or repair of M. C. B. couplers or parts thereof, is well timed and just. It only omits one essential feature, and that is, that the owner of the car on which the repair or replacement becomes necessary should not be charged for its cost unless the repair or replacement is made by a manufacturer who has a right to make and sell the coupler or broken part thereof.

The owner of the right to manufacture or sell the particular device is entitled to protection at the hands of the user; and before making any allowance for such replacement or repairs, the user should be thoroughly satisfied that such replacement or repair is done by some party who has the right to manufacture and sell the parts replaced or repaired. In default of such precaution the user may become liable as joint infringer. The user certainly cannot charge manufacturer's prices as quoted unless the articles charged for are manufactured by one who has a right to manufacture. W.

What Are the Limits of Compressed-Air Motors?

TO THE EDITOR OF THE RAILROAD GAZETTE:

So much is now being printed about compressed-air motors for street-car service that I am sure there are other readers of the *Railroad Gazette* than the writer who will be interested in knowing something further about such motors, particularly as to the practical features. No end of data have been given about the theory and the latest developments in the means for using compressed air economically and probably all engineers will accept as a fact that within a few years some important improvements have been made in the apparatus for using compressed air.

What should now be shown is the change in cost, weight and necessary space which has accompanied these improvements. Most engineers who have had occasion to examine the adaptability of compressed air apparatus for street-car service have found that the cost, weight and clumsiness of the machinery are discouraging factors. It is perhaps important to call attention to the fact that most if not all of the recent enthusiastic reports of successful practical operation have been confined to the fact of actual movement of the car. Some of the promoters have been so surprised that the compressed-air motor would "mote" economically, a fact that is well known to all experts in the use of air, that they have overlooked some very important and controlling matters.

The pace for street-car speed and acceleration has been definitely set by the cable and the electric motor. The electric motor has the higher maximum, and the more variable, speed, while the cable gives the greater acceleration at the start. Probably the maximum speed and the variations of speed can be satisfactorily arranged with the compressed-air motor, but how about the acceleration? The cable has back of it an enormous stationary engine. The electric motor from its peculiar characteristic has a very great pull at start in proportion to its weight, while the pull of a cable grip in proportion to the weight of the grip apparatus is greater than is found in any other form of car-propelling mechanism.

Some electric motors in common use will give about 80 lbs. pull on the drawbar for each 100 lbs. of weight of total electrical apparatus, while the entire electrical equipment to haul one equipped car and two trailers weighs not more than 5,000 lbs. The cost is very small, about $800 per car. The space occupied is not useful for any other purpose.

Now as to the compressed-air motor. What will be the cost of an air engine and storage tanks, etc., that will accelerate and haul for a considerable distance one motor car and two trailers? What will be the weight of the compressed-air apparatus that will accelerate one motor car and two trailers as rapidly as the electric motor—leaving aside any comparison with the superior acceleration of the cable? How much useful space will be taken by the compressed-air apparatus?

The writer is sure of several facts which furnish partial answers to to these questions. One is that $800 will buy but a very small compressed-air motor and tank outfit. Another is that the weight per unit of power is so great that the total weight of mechanism is beyond the practical limit when one or two loaded trailers must be hauled in addition to the motor car itself. Again, based on any compressed-air engine and storage tanks that the writer has ever seen or read about, the useful space occupied by the compressed-air mechanism when a trailer is to be hauled is so great as to give rise to serious objections to the plan.

Now these are points that must be considered before any conservative engineer can feel safe in saying much about the practical value of compressed air for propelling street cars under the present conditions of service. These conditions are severe, but are what the American public wants. Most users of street cars are apparently willing to crowd at the rate of 100 to 120 passengers per car and want to "get there quick," and are not satisfied unless the car has a good "hump on it."

THE INVESTOR.

The Worth of a Silver Dollar.

CLEVELAND, O., Aug. 13, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your editorial of Aug. 7 under the caption, "An Easy Way to Pay Mortgages," seems to me out of joint; that is to say, your premises do not appear to be founded on correct principles. Will you permit me, therefore, to criticise the article somewhat, with a view of obtaining more light on the subject?

You advise us that we should discuss the question of the "Free and unlimited coinage of silver," without exaggeration and without excitement, and then say that "The silver mine owners tell us that if we coined all the silver that is offered, and put only 53 cents worth of silver into each dollar, and pass an act of Congress declaring that every one must receive these silver dollars in payment of work, clothes, groceries and debts, then there will be plenty of money, higher prices, plenty of work, and that it will be easier to pay debts." Again you tell us that "The silver mine owners want us to vote that the government shall coin all the silver offered at such a rate that the silver owner will receive $1.29 an ounce. Each dollar so coined will contain about 53 cents' worth of silver, and they tell us that we can pay off our debts and mortgages easier with these 53-cent dollars than we can with 100-cent dollars." Have you stated the case fairly, or have you exaggerated what the free coinage advocate actually says?

Here is what they claim without exaggeration and it sounds different from the way you put it. They demand the immediate restoration of the free and unlimited coinage of gold and silver at the present legal ratios of 16 to 1, without waiting for the aid or consent of any other nation. Let us inquire into this proposition carefully and see if mortgages would actually be paid in 53-cent dollars under free coinage.

(1.) To make it plainer let us admit, please, that silver has been remonetized by the U. S. Government at the ratio of 16 oz. of silver to 1 oz. of gold. Mr. Smith, "a silver-mine owner," sends 1,000 oz. of standard silver to the U. S. Mint and receives therefor $1,292.90 in coined U. S. standard, legal tender silver dollars. The same day he receives this money he finds that his debts amount to exactly $1,292.90 and proceeds to pay out these same dollars to various creditors—$500 of them is the last payment on a mortgage—thus he liquidates his indebtedness in dollars worth 100 cents. Very good. When these same dollars are received by the mine owner's employees or creditors they are in turn paid to their creditors in canceling debts and in buying home comforts at 100 cents on the dollar. Therefore, do not these dollars, being legal tender and authorized by the law of the United States, with all the power such legal enactments imply, continue on paying debts at their face value of 100 cents? If not, when do they cease being 100-cent dollars and become 53-cent dollars? Kindly answer.

(2.) Again you inform us that silver now sells for about 69 cents per ounce, and leave the reader to infer that under free coinage the law would give Mr. Smith a profit of 47 cents per ounce; at the same time the dollar which the United States gave Mr. Smith is only worth 53 cents. In what manner does Smith profit by the transaction if your statement is true? In common reason can a dollar be worth more, or less, to the silver-mine owner when he receives it from the mint than it is to the mine owner's baker when received by him in exchange for bread?

(3.) The fallacy of your argument will undoubtedly appear, when you take into consideration the fact, that under free and unlimited coinage silver bullion will not sell for less than $1.2929 per ounce. To illustrate: under free and unlimited coinage—not limited as under the Bland-Allison and Sherman Acts—Mr. Smith, we will say, has 1,000 oz. of silver bullion of standard fineness to sell. One buyer offers him 69 cents per ounce, another 80 cents, still another 100 cents, and yet another 125 cents; but would he sell to any of these so long as he could have it coined by the U. S. Mint into standard legal tender, worth $1.2929 per ounce? Assuredly not. Then would not the mint value always represent the minimum commercial value of silver bullion as well as gold bullion, as it did from 1792 to 1873.

You may answer in the language of the gold standard advocates, that legal tender laws cannot confer value, or coinage cannot affect value; that coinage can only certify to quality and quantity of the thing stamped. Then we ask you to kindly explain why it is, if neither law nor coinage can affect value, that 412½ grs. of standard silver coined is worth 100 cents in gold, while 412½ grs. of standard silver uncoined is worth but 53 cents in gold? ANDREW MARCELLUS.

[(1) It is quite true that Mr. Smith will be able to pay his debts in the legal tender silver dollars, provided he has not contracted to pay them in gold, and provided they are owed to his unfortunate fellow-citizens of the United States. It is also true that these silver dollars will keep on paying debts, and within the limits of the United States one of these silver dollars must be taken to cancel a debt of 100 cents. That is just what we are trying to prevent. That is where the repudiation comes in; for these silver dollars will not be *worth* 100 cents measured in gold, or measured in labor, or measured in food, or measured in clothes. The mine owner's employees or creditors cannot buy home comforts with these dollars at their face value for a great while, for the man who now owns those home comforts will raise the price of them proportionately to the depreciation of the money that he is to receive. This is not theory; this is history, repeated over and over again in the story of man's struggle to live. These dollars will never cease to be 100-cent dollars because they will never begin to be 100-cent dollars. They will be worth the bullion value of the silver, be that 53 cents or more or less.

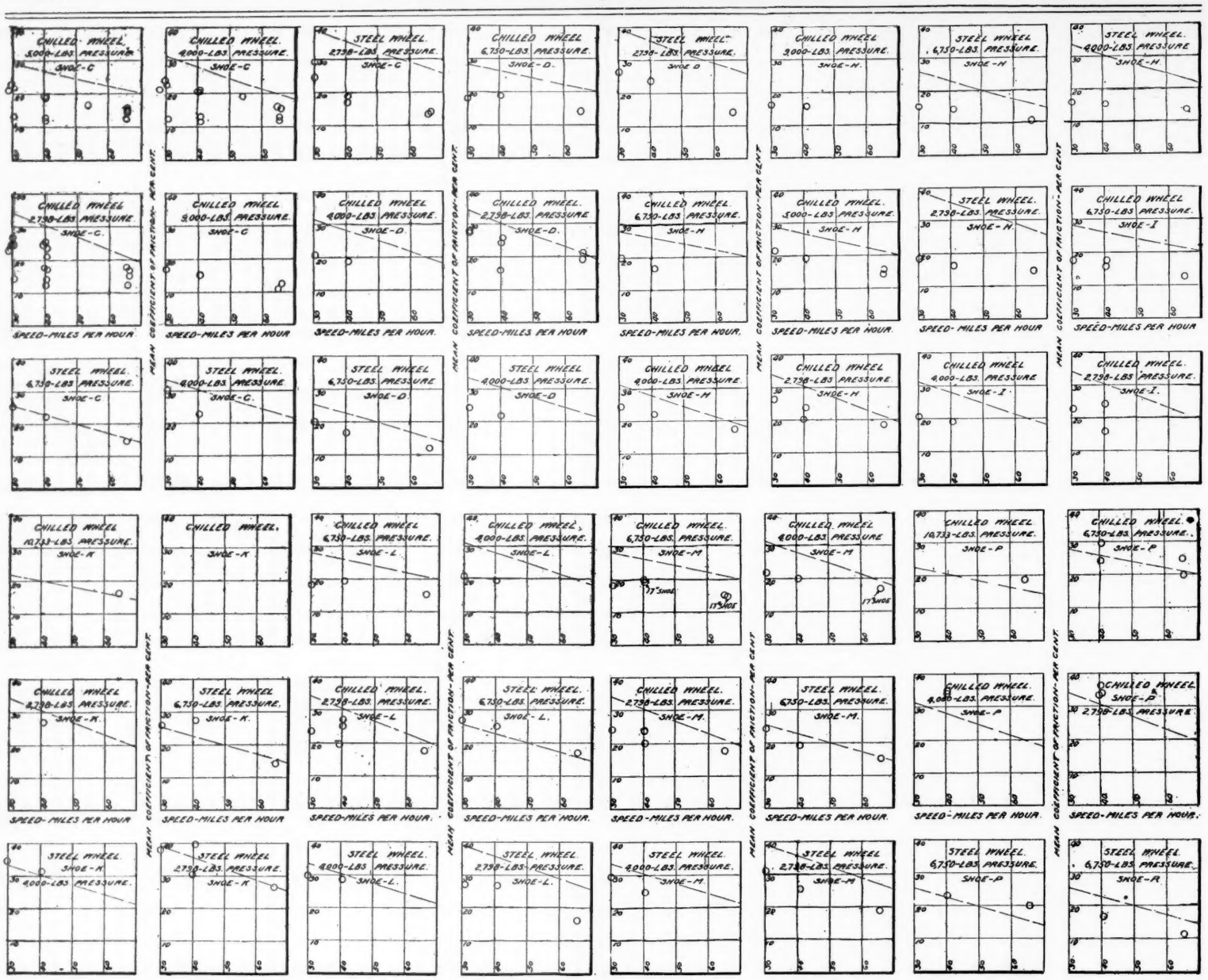
(2) The average monthly price of silver per Troy ounce this year has been in cents, January, 67.13; February, 67.67; March, 68.40; April, 67.92; May. 67.88; June, 68.69; July, 68.75. Since Aug. 10 the price has fallen to 66 cents. The "coining value" is $1.29 (or close to it). The difference is the profit of Mr. Smith in the transaction, provided he has debts incurred under the gold standard, and provided that he can buy what he wants before prices go up, and so long as the wages of his employees remain as they were on the gold basis. As Mr. Smith is very active and as he can command much capital he will undoubtedly find a way to make a good deal of money out of this difference, between the bullion value and the coining value of silver.

(3) Is it supposable that if we open our mints to the free coinage of silver, for the account of individuals, at a ratio of 16 to 1, and make the resulting dollars legal tender within the limits of the United States, is it supposable that this action will raise the price of the enormous mass of silver existing in the world? When you make this assumption you beg the whole question. Very likely there will be a speculative rise as happened in 1890. The Sherman act was passed July 14, 1890. This provided for the purchase of 4,500,000 ounces a month at the market value of bullion and the silver so purchased was paid for practically in gold; that is, it was paid for in notes which were immediately redeemable in gold. There was an immediate speculative rise. July 1 silver bullion was worth $1.04 per ounce; Aug. 19 it had risen to $1.21. In the beginning of September it began to fall and by the end of December it had come down again to $1.04. We have been led to suppose that the fall was due to the increased production. It is very likely that a somewhat similar set of events will follow free coinage. Production will be enormously stimulated, silver will flow to our mints from all over the world, there will be a rise for a short time and then the price will begin to drop, and in the long run people will discover that silver can purchase in the market no more than what it is worth as bullion, even when the stamp of the United States is put upon it, and even if we add the motto "In God We Trust."—EDITOR RAILROAD GAZETTE.]

Laboratory Tests of Brakeshoes.

In 1895 the Committee on Laboratory Tests of Metal for Brakeshoes submitted to the Master Car Builders' convention a report of results obtained with 14 different kinds of brakeshoes. This report was printed in full in the *Railroad Gazette*, June 21, 1895, and in the issue of June 19, 1896, will be found a summary of averages and a discussion of the work done by the Committee up to the present time.

The Apparatus.—The apparatus used in making these tests (shown in Fig. 1) was designed to reproduce the conditions of service so far as it is possible to do so in laboratory work. A horizontal shaft, 7 in. in diameter, supported in fixed bearings, has keyed on one end a 33-in. car wheel, and on the other a clutch by means of which it may be connected to a jack shaft driven by a 40-H. P. Westinghouse standard engine. Secured to the shaft carrying the car-wheel is a fly-wheel 48 in. in



Diagrams Showing Results of Tests of Brake-shoe Metals Made by the Committee of the Master Car Builders' Association.

For an explanation of these diagrams see the text of the article herewith.

diameter and 30 in. across the face, built up of cast-iron discs, and steel-tired to make it secure against bursting.

The total weight of the shaft, fly-wheel, car-wheel and other revolving parts is 12,600 tons, and the mass is so distributed that it has the kinetic energy of 12,000 lbs. moving with the velocity of a point on the periphery of the car-wheel. Twelve thousand pounds is taken to be the maximum load upon one journal of either a freight or passenger car, and hence the fly-wheel when in motion has the stored energy that in practice is overcome by breaking a single car-wheel.

Underneath the car-wheel is a twin-lever supporting on one end the journals which carry a shaft and wheel. This wheel is steel tired, the tread corresponding to the profile of the rail head, and by means of weights on the outer end of the twin lever it may be forced against the car-wheel. This arrangement was designed to give the reaction on the wheel that the rail gives in service, but it was found impracticable to use it because of the vibration produced.

The brakeshoe is applied to the wheel by means of a combination of two levers, to the first one of which the brakehead is attached in such manner that any wear of either wheel or shoe can be readily taken up by vertical adjustment. The desired braking pressure is obtained by suspending weights from the free end of the second lever. The dimensions of the levers make the ratio of braking pressure to the weight used as 24 to 1. The shoe is keyed to the brakehead as in ordinary practice, and the latter is connected by rods and yokes with a dynamometer for measuring the friction between shoe and wheel. Until the application is made the shoe is kept clear of the wheel, the levers being so supported that they may be easily tripped and the full braking pressure applied instantaneously.

In making a test the clutch is thrown in and the engine started. When the fly-wheel has attained the desired velocity, as indicated by the gage of a Boyer speed recorder, the clutch is thrown out, the breaking levers are tripped and the revolving mass is brought to rest by the

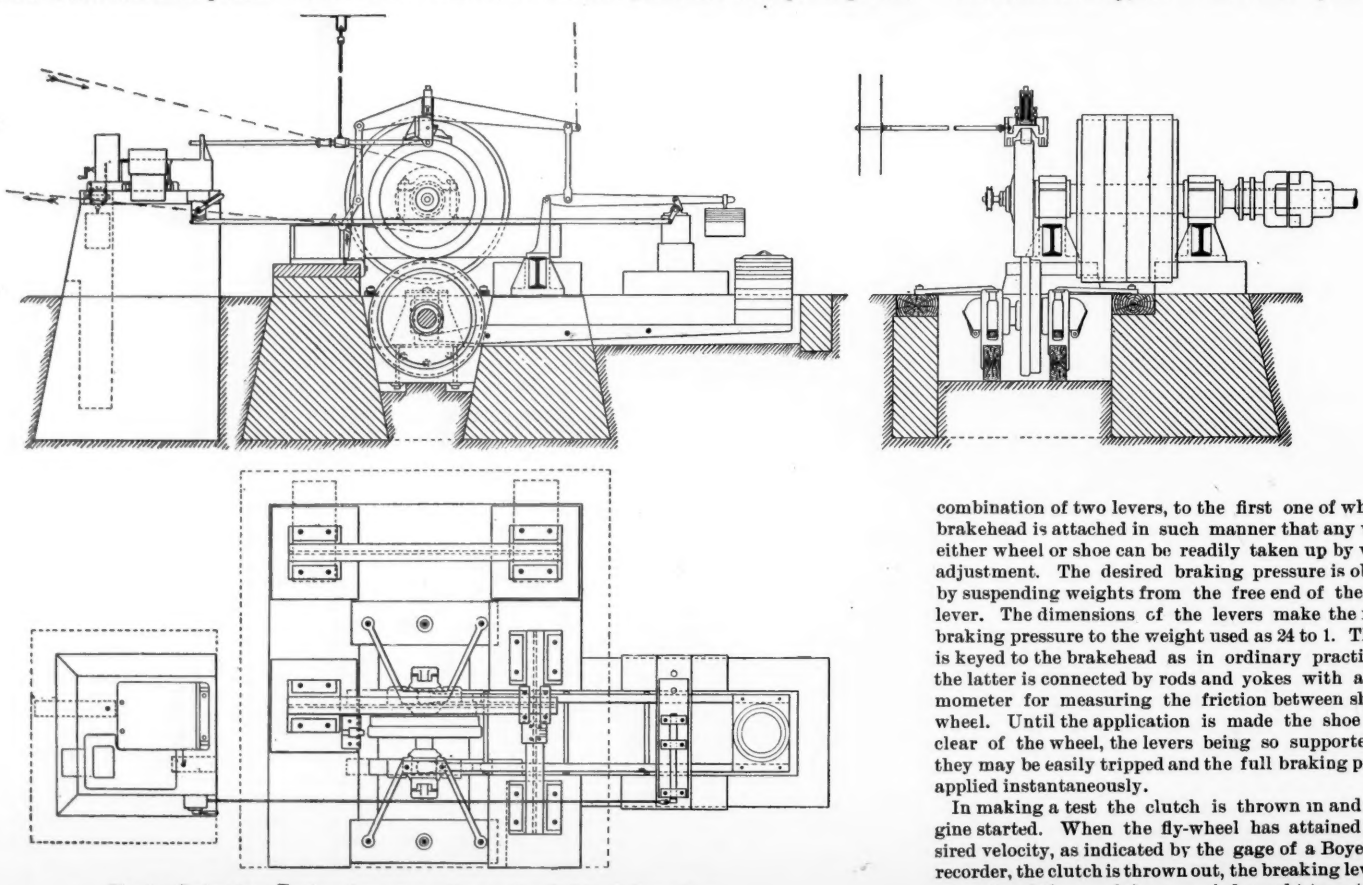


Fig. 1.—Brake-shoe Testing Apparatus—Master Car Builders' Committee.

action of the brakeshoe upon the car-wheel. In all tests the braking pressure remains constant after it is once applied.

The dynamometer is of the Emory type and will accurately measure any pull up to 3,000 lbs. The pull on the brakeshoe is transmitted to the dynamometer and the magnitude of the retarding force is measured by the deflection of a calibrated spring. The motion of the spring is transmitted by suitable levers to a small carriage on which a marking pencil is mounted, and this carriage rides between guides on a track parallel to the axis of a revolving drum carrying the paper upon which the pencil registers. The drum is driven from the wheel shaft by means of belts and gearing, and hence a diagram is obtained, the length of which is proportional to the distance run and the height of which is proportional to the friction of the shoe on the wheel.

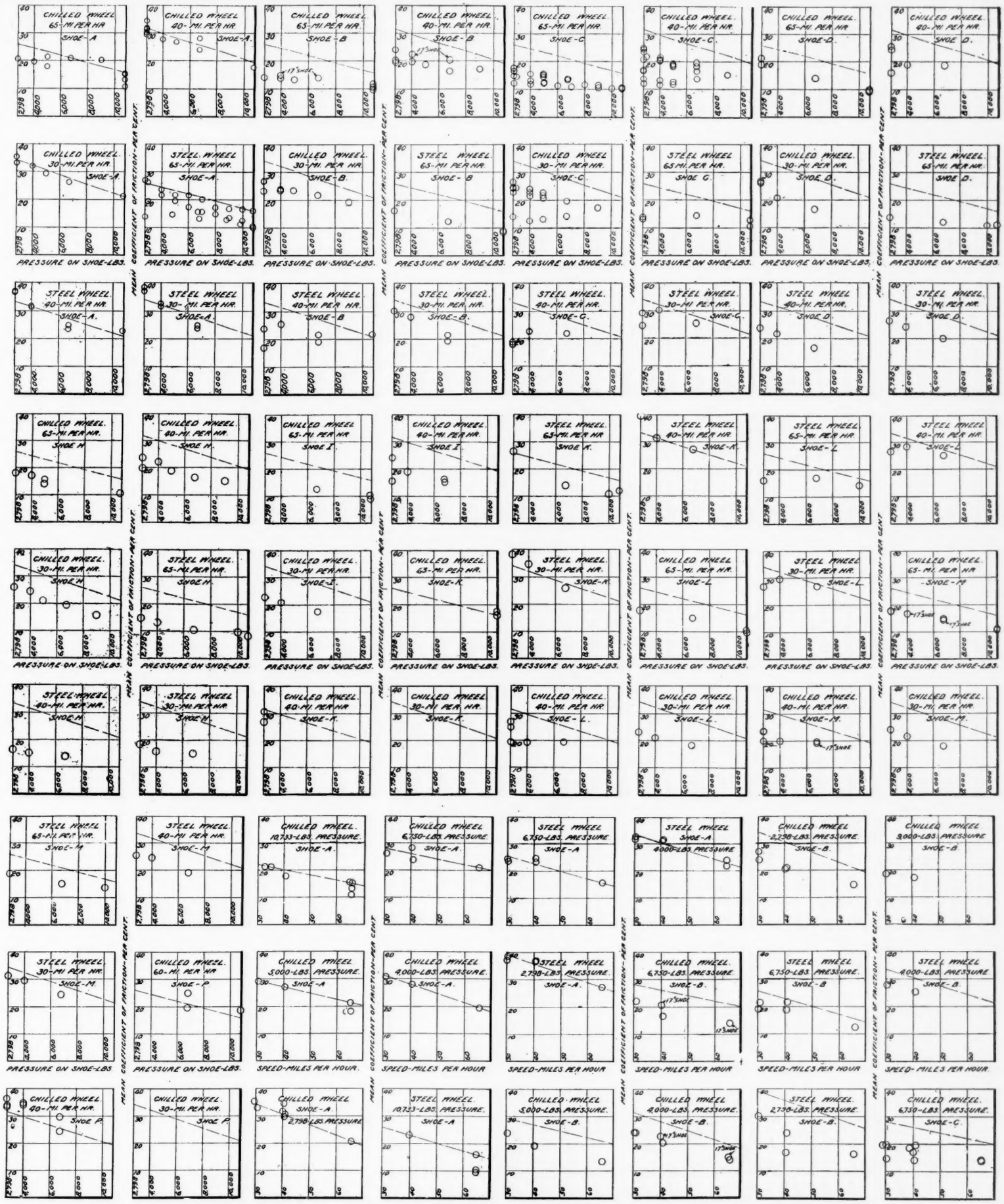
A second pencil carried on the armature of an electro-magnet in circuit with a clock beating half seconds traces a time record from which the initial speed of the shaft is determined. A third pencil connected with the Boyer speed recorder traces a diagram the height of which is proportional to the velocity of the wheel.

Results and Records.—The tests made in 1895 indicated that the co-efficient of friction varies with changes of pressure and of speed, and the greater part of the tests made this year were to determine the laws of this variation. Tests were made at 65, 40 and 30 miles an hour, with different braking pressures for each of these speeds, both on chilled and on steel-tired wheels. Under each set of conditions a series of tests (usually three or five) was made and in many instances more than one series was run under the same conditions as to speed and braking pressure. In order that the law of variation may be readily apparent the results are plotted in two ways:

1. Tests of each shoe made at the same speed are plotted with breaking pressures in pounds as abscissae and mean co-efficients of friction in per cent. as ordinates.

2. Tests of each shoe made at the same speed are plotted with initial speeds in miles per hour as abscissae and mean co-efficients as ordinates.

In the diagrams each circle represents the average of a series. Individual tests in a series agreed closely among themselves, as in the work of 1895.

Inasmuch as soft cast-iron gives the highest co-efficient of any material now in common use for brakeshoes, it has been taken as the basis in comparing the performance of shoes of different materials. In each diagram showing results obtained with the soft cast-iron shoe (A)

Diagrams Showing Results of Tests of Brake-shoe Metals Made by the Committee of the Master Car Builders' Association.

For an explanation of these diagrams see the text of the article herewith.

a line is drawn indicating the rate of increase of the mean co-efficient as the initial speed or the braking pressure is reduced. In diagrams for the other shoes the line for *soft cast-iron under similar conditions* is drawn, affording a direct comparison of each shoe with the standard.

A few tests only were made of shoes E, F, G, J and N, and no diagrams are shown for them. Some new chilled shoes were furnished by the Lappin Co., but proved to be so hard that they could not be machined to fit the

wheel. Four new shoes were offered for test this year: a Safety shoe, K, of different material; the Kinzer, P; the Corning, Q, and the Pollock, R. Lack of time prevented tests of the Corning shoe.

Shoes of hard cast iron, B, and of wrought iron, M, 17 in. long were tested, but with the exception of the M shoe at 40 miles an hour no greater friction was obtained than with the 13-in. shoe. These results are marked "17-in. shoe" in the diagrams. Further tests of 17-in. shoes were not made because the distortion of the shoe due to the heating of the surface in contact with the wheel rendered it impossible to maintain the full bearing of the shoe upon the wheel.

Some tests of a soft cast-iron, flanged shoe, on a steel tired wheel were made but the results obtained do not show as high a co-efficient of friction as might have been

G. Special steel tire malleable iron; Dayton Malleable Iron Co.

H. The Congdon shoe—cast-iron body with wrought-iron insets; The Sargent Co., Chicago.

I. The Meehan shoe—cast-iron body with crucible-steel insets; The Sargent Co., Chicago.

J. The Lappin shoe—chilled iron; The Lappin Brake Shoe Co., New York City.

K. The Safety shoe—body of hard cast iron with 10 wooden plugs 1 in. diameter let into face; The Safety Brake Shoe Co., Boston, Mass.

L. Soft steel (pressed); Schoen Manufacturing Co., Pittsburgh, Pa.

M. Wrought iron (pressed); Schoen Manufacturing Co., Pittsburgh, Pa.

N. The Sargent special shoe—cast-iron body with chilled-iron insets; The Sargent Co., Chicago.

P. The Kinzer shoe—cast-iron shell filled with a composition; The Kinzer & Jones Manufacturing Co., Pittsburgh, Pa.

Q. The Corning shoe—iron body having chilled face with soft gray cast-iron insets placed diagonally across it; The Corning Brake Shoe Co., Chicago.

R. The Pollock shoe—cast-iron body with 25 wrought-iron plugs ¾ in. in diameter let into face; The Sargent Co., Chicago.

At the request of the manufacturers of brakeshoes chemical analyses and physical tests were made in order to determine the composition and properties of the shoes tested. The results of these analyses and tests are given as follows:

Chemical analyses of samples of soft cast iron, hard cast iron, soft cast steel and hard cast steel, representing shoes "A," "B," "C" and "D," respectively.—Made by Dr. C. B. Dudley, Altoona, Pa.

	Carbon.	Phosphorus.	Manganese.	Silicon.	Sulphur.
A 1	3.42	0.82	0.24	2.09	0.11
A 2	3.50	0.82	0.28	2.08	0.11
A 3	3.45	0.81	0.27	2.04	0.11
B 1	3.82	0.42	0.41	0.78	0.17
B 2	3.72	0.43	0.36	0.75	0.15
B 3	3.76	0.43	0.35	0.75	0.16
C 1	0.27	0.04	0.64	0.21	0.03
C 2	0.28	0.04	0.64	0.21	0.03
C 3	0.27	0.04	0.67	0.20	0.03
D 1	0.25	0.08	0.56	0.22	0.06
D 2	0.27	0.08	0.56	0.23	0.06
D 3	0.25	0.08	0.55	0.22	0.06

TESTS OF BRAKE-SHOE METAL.—TABLE OF AVERAGES.—RESULTS WITH 13-IN. SHOES.

Shoe.	Kind of wheel.	Nominal speed 65 miles per hour.							Nominal speed 40 miles per hour.							Nominal speed 30 miles per hour.						
		Pressure on shoe. Lbs.	Travel of wheel. Ft.	Initial speed, mi. per hour.	Mean pull on shoe. Lbs.	Mean co-efficient of friction. Per cent.	Max. co-efficient near beginning. Per cent.	Co-efficient at 15ft. from end of stop. Per cent.	Pressure on shoe. Lbs.	Travel of wheel. Feet.	Initial speed, mi. per hour.	Mean pull on shoe. Lbs.	Mean co-efficient of friction. Per cent.	Max. co-efficient near beginning Per cent.	Co-efficient 15 ft. from end of stop. Per cent.	Pressure on shoe. Lbs.	Travel of wheel. Feet.	Initial speed, mi. per hour.	Mean pull on shoe. Lbs.	Mean co-efficient of friction. Per cent.	Max. co-efficient near beginning Per cent.	Co-efficient 15 ft. from end of stop. Per cent.
A	Chilled	10,773	1,079.2	65.73	1,640.6	15.3	15.4	22.3	6,750	360.0	40.01	1,919.2	28.4	.....	35.8	6,750	182.8	30.79	1,779.1	26.4	31.7	32.7
B	"	10,733	1,502.6	65.82	1,150.9	10.7	11.7	17.7	6,750	573.3	41.00	1,120 8	16.6	16.7	25.3	6,750	229.3	31.02	1481.7	22 0	23.4	26.6
C	"	10,733	1,580.8	65.98	1,159.0	10.8	10.4	21.3	6.750	496.1	40.91	1,319.4	19.6	19 3	27.7	6,750	253.5	30.48	1,324.5	19.6	....	24.0
D	"	10,733	1 724.3	65.55	992.6	9.2	9.7	17.9	6,750	589.9	40.55	1,262.1	18.7	16 3	28.3	6,750	257.0	29.84	1,144.0	16 9	17.9	22.8
F	"	10,733	1,911.2	65 71	966.7	9.0	10.2	18 2	6.750	616.9	40.46	1,192.6	17.7	18.4	30.6	.....	.....	.....	.....	.....	.....	.....
G	"	10,733	1,758 8	65.41	1,048.8	9 6	10.8	18.2	6.750	538.7	40 37	1,323.6	19.6	19.8	32.4	.....	.....	.....	.....	.....	.....	.....
H	"	10,733	1,384.9	65.10	1,164.0	10.8	11.1	17.8	6,750	520.6	41.09	1,120.4	16.6	15.5	23.1	6,750	230.9	30.66	1,329.3	19.7	19.9	24.3
I	"	10,733	1,612.9	65 58	1,113.9	10.4	11.9	18.3	6,750	607.1	40.55	1,060.5	15.7	16 8	22 8	6,750	263.1	30 27	1,178.9	17.5	18.2	22.9
J	"	10.733	1,607.8	65.29	1,076.0	10 0	10 3	17.1	6,750	896.8	41.18	815.5	12.1	13.1	20.5	.....	.....	.....	.....	.....	.....	.....
K	"	10,733	957.4	64 56	1,735.0	16.2	15.9	22.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
L	"	10.733	1,521.1	65.64	1,114.9	10.4	9.6	20.6	6,750	565.1	40.46	1 302 6	19.3	17.4	28.5	6,750	269 0	30.27	1,231 7	18 3	19.7	26 6
M	"	10,733	1,541.1	65.37	1,154.4	10.8	10.8	20.3	6.750	539.9	40.28	1,326.8	19 7	17.8	29 0	6,750	262.0	30.57	1,218.4	18.1	.....	25.8
N	"	.....	.....	.....	.....	.....	.....	.....	6,750	692 8	40.91	1,152.2	17.1	17.2	23.0	.....	.....	.....	.....	.....	.....	.....
P†	"	10,733	802.5	64.29	2,011.6	18.7	21.1	27.3	*6,750	273.6	40.61	1,998.8	29.6	36 1	35.4	.....	.....	.....	.....	.....	.....	.....
A	Chilled	6,750	1,404.5	65.46	1,418.1	21 0	20.3	30.5	4,000	544.1	40.64	1,128.4	28.2	24.5	33.7	4,000	268.2	30.38	1,278 7	32.0	36.5	35.4
B	"	5,000	2,351.4	66.18	666.5	13.3	16.1	22 8	4,000	740.2	41.09	804.0	20.1	21.2	25.8	4,000	321.5	30.27	963.7	24.1	25.2	32.4
C	"	6.750	1,813.4	65.19	913.0	13.5	12.6	26.9	4,000	748.4	40.69	856 4	21.4	21.4	31 2	4,000	342.9	29.94	972.1	24 3	25 8	28.9
D	"	6,750	2,061.3	65.46	929.8	13 8	12.4	25.4	4,000	824.7	40.91	788.9	18.9	18.5	28.2	4,000	385.8	30.42	860.9	20.7	22 0	29.6
F	"	6,750	2,202.8	65.19	871.3	12.9	14 4	27.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
G	"	6,750	2,551.4	65.57	767.2	11.7	14.7	26.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
H	"	5,000	2,115 4	65.87	785.0	15 7	15 3	29 6	4,000	677.1	41.00	894.0	22.4	21.3	30.9	4,000	326.4	30.57	993.9	24 9	26.0	29.8
I	"	6,750	2,154.6	65 19	839.1	12.7	14.3	21.7	4,000	787 6	40.61	764.3	19.1	21.3	28.0	4,000	356.1	30.27	339.7	21.0	23.6	26.6
J	"	6,750	2,456.3	65.55	758.8	11.2	11.9	22.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
L	"	6,750	1.960 3	66.00	1,007 8	14.9	14.4	27.4	4,000	728.9	40.46	777.6	19.4	17.6	31.5	4,000	377.2	30.42	837.8	21.0	21.3	28.5
M	"	6,750	1,876.6	65.37	999.4	14.8	15.9	26.6	4,000	715.9	40.46	792.2	20.0	.....	29.0	4,000	375.7	30.57	863.9	21.7	22.6	29.8
P†	"	*6,750	966.5	65.79	1,688.9	25 0	26.4	34.3	*4,000	426 0	40.46	1,385.8	31.7	36.2	38.5	.....	.....	.....	.....	.....	.....	.....
A	Chilled	2.798	2,608.5	66.00	579.6	20.8	23.0	28.1	2,798	827.9	40.46	968.1	34 6	35.0	43.9	2,798	299.3	29.45	989.5	35.4	38.5	44.6
B	"	2,798	3,473 8	65.91	392.7	14.1	13.7	20.4	2.798	891.3	40.91	633.1	22.6	24.2	29.0	2,798	416.6	30 42	756.2	27.0	26.4	33 2
C	"	2,798	3,067.4	65.64	496.1	17 7	15.3	34.6	2,798	819 3	39.56	684.0	24.5	22 0	38.5	2,798	370.4	30.12	744.1	26.7	26.0	38.2
D	"	2,798	3,236.3	65.79	585.5	21.2	21.3	34.1	2.798	1,002.3	40.76	719.3	25 7	25.2	29.6	2,798	439.9	30.42	767.5	27.4	28 4	32 7
E	"	.....	.....	.....	.....	.....	.....	.....	2,798	1,287.2	40.24	460.4	16.5	18.8	29 5	.....	.....	.....	.....	.....	.....	.....
F	"	.....	.....	.....	.....	.....	.....	.....	2,798	1,153.3	40.37	629.3	22.7	26.8	43.5	.....	.....	.....	.....	.....	.....	.....
G	"	.....	.....	.....	.....	.....	.....	.....	2,798	1,215.7	40 55	609.4	21.8	26 5	44 8	.....	.....	.....	.....	.....	.....	.....
H	"	2,798	2 954.7	65.46	508.6	18.1	20.8	29.5	2,798	853.0	40.82	667.8	23.9	26.8	30.0	2,798	431.0	30.93	736.5	26.4	26.9	30.7
I	"	.....	.....	.....	.....	.....	.....	.....	2,798	1,037.7	40.37	683.2	24.4	28.5	34.9	2,798	445.1	30.42	643.2	23.0	24 3	27.3
J	"	.....	.....	.....	.....	.....	.....	.....	2,798	1,492.0	40.46	470 8	16.8	18 7	28.1	.....	.....	.....	.....	.....	.....	.....
K	"	.....	.....	.....	.....	.....	.....	.....	2,798	764.4	40.82	750.2	26.8	26.1	33.8	.....	.....	.....	.....	.....	.....	.....
L	"	2,798	3 165.9	65.79	495.2	17.7	17.9	34.4	2,798	817.2	40.61	751.5	26 9	25.8	36.1	2,798	463.2	30.42	657.1	23.4	25.3	30.9
M	"	2,798	2,965.3	65.42	497.5	17.8	18.1	33 2	2,798	828.7	40.61	663.9	23.7	24.7	36 5	2,798	440.5	30.57	677.8	24.2	23.5	32.1
N	"	.....	.....	.....	.....	.....	.....	.....	2,798	1,270.2	40.46	586.5	21.0	21.4	30.2	.....	.....	.....	.....	.....	.....	.....
P†	"	.....	.....	.....	.....	.....	.....	.....	2,798	604.8	39.89	936.2	33.5	36.6	36.6	.....	.....	.....	.....	.....	.....	.....
A	Steel-tired	10,733	1,132 5	65.38	1,730.8	16.1	16.7	26.1	6,750	364.0	40.76	1,671.8	25.0	29.9	31.6	6,750	185.8	30.12	1,670.9	24.8	.....	35.6
B	"	.....	.....	.....	.....	.....	.....	.....	6.750	435 4	40.91	1,464.0	21.7	25.3	28.0	6,750	223.8	30.72	1,461.1	21 6	.....	29 2
C	"	.....	.....	.....	.....	.....	.....	.....	6 750	421.5	40.79	1,487.8	22.0	.....	37.8	6,750	182.5	30.34	1,713.5	25.4	.....	34.7
D	"	10,000	1,625.5	65.64	1,120.2	11 2	.....	26.3	6,750	562.5	40.46	1,226.5	16.7	13.9	32.0	6,750	235.7	30.42	1,357.1	20.1	.....	32.8
H	"	10 000	1,707.6	66.32	970.9	9.7	10.0	17.7	6.750	653.1	40.91	942.8	14.0	14.8	21.3	6,750	296.1	30 12	993.3	15.0	15.2	21 0
K	"	10 000	1,564.8	65.42	1,085.4	10.9	13.0	20.6	6,650	314.7	40.76	1,858.4	27.5	37.8	33.9	6,750	162.7	30.12	1,753.8	26.0	.....	31.6
L	"	10,000	1,273.2	65 64	1,417.3	14.2	13.2	28.5	6.750	364.2	40.46	1,495.5	25.1	.....	43.4	6,750	161 1	29.67	1,823.8	27.0	.....	42.2
M	"	10,000	1,264.7	66.09	1,383 4	13.8	11.1	30 8	6,750	501.8	40.61	1,300.6	19.3	17.1	33 8	6,750	197.2	30.26	1,636.4	24.4	.....	37.5
P†	"	.....	.....	.....	.....	.....	.....	.....	6,750	386.7	40.31	1,558.5	23.1	26 2	31.9	.....	.....	.....	.....	.....	.....	.....
R	"	.....	.....	.....	.....	.....	.....	.....	6,750	532.0	40.57	1,130.1	16.7	18.6	23.4	.....	.....	.....	.....	.....	.....	.....
A	Steel-tired.	6,750	1,620.3	65.79	1,062.6	15.7	21.0	27.2	4,000	401.8	40.91	1,266.6	31.7	.....	38.8	4,000	248.4	30.57	1,310.8	32.8	.....	29.1
B	"	6.750	1,938 1	66.09	844.2	12.5	18.0	23.0	4,000	605.8	40.91	1,015.4	25.4	.....	31.8	4,000	293.7	30.42	1,117.8	28.0	....	34 7
C	"	6.750	1,729.3	65 79	975.2	14.5	12.1	32.5	4,000	664.9	40.76	916.6	22.9	19.8	40.3	4,000	273.0	30.72	1,213.7	30.3	.....	41.9
D	"	6,750	2,046.2	66 09	821.4	12.2	9 8	29.9	4,000	706.7	40.46	871.7	21.8	19.6	38 7	4,000	326.9	30.57	974.7	24.4	23.2	37.7
H	"	6,750	2,167.4	65.49	715.2	10.6	10.6	20.5	4,000	930.1	40.76	610.0	15.3	17.1	24.6	4,000	471.9	30.27	597.9	15.8	15 9	22.5
K	"	6,750	1,802.9	65.79	945.9	14.0	19.8	27.8	4,000	512.6	40.61	1,262.3	31.6	.....	37.1	4,000	229.7	29 82	1,391.4	34.8	41.6	39.7
L	"	6,750	1,526.7	65.49	1,445.7	17.0	14.2	37.9	4,000	550.6	40.76	1,142.3	28.6	.....	44.1	4,000	265.1	30.01	1,190.0	29.8	....	44 3
M	"	6,750	1,786.4	65 94	1,014.3	15.1	12.8	33.3	4,000	641.8	40.61	935.9	24.7	.....	44.5	4,000	271.6	30.12	1,178.7	29.5	27.9	45.0
P†	"	6.750	1,300.3	65.64	1,338.1	19.8	22.2	28.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
R	"	6,750	2,085.5	65.34	770.1	11.4	12.9	21.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
A	Steel-tired.	2,798	2,156.2	65.79	749 5	27.2	32.5	37.5	2,798	580.4	40.76	1,034.6	37.0	.....	41.8	2,798	295.0	30.42	1,076 3	38.5	.....	44.5
B	"	2,798	3,629.4	65 94	462.5	16.5	22.3	28.0	2,798	875.1	40 91	670.2	24.0	26.9	31.6	2,798	364.7	30.27	844.6	30.2	31.1	33.6
C	"	2,798	3,412.1	65.64	395 9	14 2	13.6	40.1	2,798	978.2	40.61	521.9	18.7	17.1	37.3	2,798	357.0	30.12	821 5	29.4	.....	41.6
D	"	2,798	3,582.4	65.79	386.5	13.8	14 8	34.5	2,798	877.0	40.23	642.2	22.9	21.2	40.0	2,798	404.9	30.12	742.4	26.5	.....	34.7
H	"	2,798	3,341.0	65 79	417.6	14.9	17.7	24.3	2,798	1,142.4	40.91	462.5	16.5	19.2	27.4	2,798	538.1	30.12	517.7	18.5	19.0	25 8
K	"	2,798	2,287.3	65 79	741.2	26.5	30.3	38.2	2,795	572.1	40.76	1,109.7	39.7	42.2	40.8	2,798	293.4	29.97	1,072.7	38.3	.....	41.9
L	"	2,798	3,349 8	65.64	451.4	16.2	17.5	47.5	2,798	813.5	40.76	745.6	26.7	23.7	42.5	2,798	431.7	30.72	759.4	27.1	.....	43.2
M	"	2,798	3,035.6	65.94	522.1	19.0	17.4	45.4	2,798	850.0	40.91	715.9	25.6	25.7	47.3	2,798	368.0	30.12	875.6	31.3	30.0	45.6

RESULTS WITH 17-INCH SHOES.

B	Chilled.	10,733	1,146.5	66.20	1,221.3	11.4	12.1	18 5	6.750	477.5	40.64	1,385.6	20.5	20.7	26.1	.....	.....	.....	.....	.....	.....	.....
B	"	6.750	1.867.4	66 69	930.4	13 8	13.9	24.7	4,000	695.8	40 46	900.8	22.5	23.9	27.9	.....	.....	.....	.....	.....	.....	.....
M	"	6.750	1,662.0	66.27	970.9	14 4	14.4	27.3	6,750	483.0	40.61	1,285.9	19.1	17 7	30.2	.....	.....	.....	.....	.....	.....	.....
M	"	4,000	2,273.3	66.27	661.9	16.6	15.5	31.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

RESULTS WITH FLANGED SHOE.

A	Steel-tired.	10,733	944.3	64 29	1,703 3	15.9	17 8	26.0	2,798	593.4	40.31	966.9	34 6	37.1	42.9	.....	.....	.....	.....	.....	.....	.....
A	"	6,750	1,216.6	63.84	1,302.5	19.3	27.0	30.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* In these tests the Kinzer Brake Connection was used. In this connection a spring is interposed between the brakehead and the shoe.
† In tests on chilled wheel the composition only bore on the wheel, the available area of shoe being about 85 per cent. of the area of other 13-in. shoes.
‡ In tests on steel-tired wheel, the cast-iron shell also bore on wheel.

expected. The conditions of shoe and wheel surface so far as known were favorable for getting a high co-efficient and the area of bearing surface was 70½ sq. in. as against 42 sq. in. with the 13-in. shoe.

The different brakeshoes are denoted by letters as below:

A. Soft cast iron; Pennsylvania Railroad Co., Altoona, Pa.

B. Hard cast iron; Ramapo Wheel & Foundry Co., Ramapo, N. Y.

C. Soft open-hearth steel; Solid Steel Co., Alliance, O.

D. Hard open-hearth steel; Solid Steel Co., Alliance, O.

E. Malleable iron; Dayton Malleable Iron Co., Dayton, O.

F. Special chilled wheel malleable iron; Dayton Malleable Iron Co.

Dynamometer drilling tests of samples of soft cast iron, hard cast iron, soft cast steel and hard cast steel, representing shoes "A," "B," "C" and "D," respectively.—Made by Prof. Wm. F. M. Goss, of Purdue University, La Fayette, Ind.—Foot pounds of energy required to remove one cubic inch:

A 1	39951.9	B 1	37317.7
A 2	37317.7	B 2	37756.7
A 3	38488.5	B 3	38781.2
C 1	72293.9	D 1	66732.8
C 2	72147.6	D 2	66879.2
C 3	72147.6	D 3	66879.2

It was found that when the shoe was hot at the commencement of the application the co-efficient of friction

obtained was lower than if the shoe had been cold, and to eliminate this cause of variation the shoe was cooled between tests, that its initial temperature might always be approximately the same. To insure clean dry surfaces the wheel tread and shoe were sponged with benzine before each test, except in the case of the lower tests plotted in diagram marked "Steel Wheel-65 mi. per hr.-Shoe A."

Transverse tests of samples of soft cast iron, hard cast iron, soft cast steel and hard cast steel, representing shoes "A," B," "C" and "D," respectively.—Made by the Norfolk & Western Railroad Co., at Roanoke, Va.—Each curve represents the average of three tests. —Sizes of bar, 2 × 2 in.; span, 21¼ in.

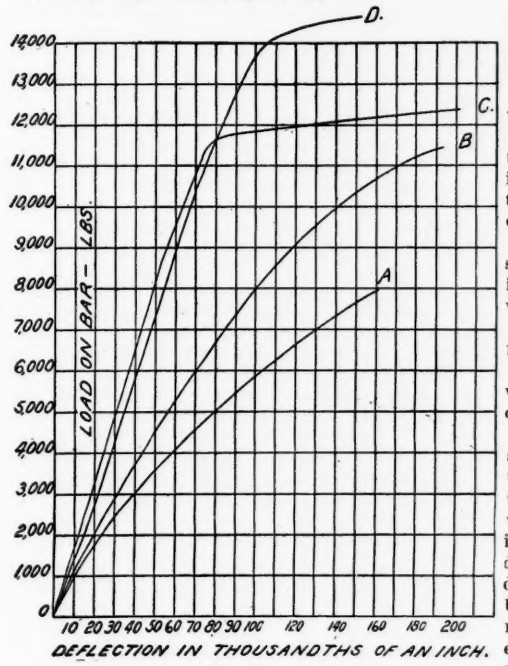


Fig. 2.

Those shoes in which the rubbing surface is cast iron, either in whole or in part, become much hotter during a test do the shoes of wrought iron and steel. With the P shoe practically no heat is absorbed by the composition.

When a cast-iron shoe is used on the chilled wheel small particles broken off of the shoe adhere to the wheel surface and make it rough, the roughness increasing with the number of applications. The hard cast iron shoes B and K do not make the wheel so rough as does the soft shoe A.

Continuous use of a wrought-iron or steel shoe on the chilled wheel makes the latter quite smooth. When these shoes become heated the metal flows and particles accumulate at the end of the shoe last in contact with the wheel. With the hard steel shoe D this occurs to a lesser extent than with the soft shoes C, L and M.

Those shoes of cast iron with wrought-iron or steel insets (H and I) roughen a chilled wheel slightly and the insets flow to some extent and are forced into the cast-iron body of the shoe.

The composition shoe P has no tendency to cut the wheel and imparts to it a high polish.

Cast-iron shoes (A, H and K) tend to smooth a steel-tired wheel when the breaking pressures are light, but in the heavy-pressure tests particles of the iron adhere to the wheel and make it rough, though not to the same extent as with the chilled wheel.

Steel and wrought-iron shoes (C, D, L and M) score the steel-tired wheel and pieces torn off of the shoe become imbedded in the wheel. The hard shoe D scores the wheel worse than the softer ones.

The steel and wrought-iron insets of shoes H, I and R roughen the steel wheel.

Shoe P used on a steel wheel fills irregularities of the wheel surface and imparts to it a polish as with the chilled wheel.

Most of the tests made in 1895 were repeated this year and the results check closely with those previously obtained, except in the case of shoes C and D. It will be remarked that the diagrams illustrating the results with the C shoe on chilled wheel show a great variation in the co-efficient of friction obtained under similar conditions as to pressure and speed. This is due to the condition of the wheel surface; a smooth wheel, such as can best be obtained by the continuous use of this shoe, is necessary in order to obtain the higher values for the co-efficient of friction, and a few tests with a soft cast-iron shoe will so roughen the wheel as to give a low co efficient. The effect of a rough wheel is most marked with light braking pressures. After the cause of this variation was determined, steel and wrought-iron shoes were not tested until the wheel surface had been put in a condition favorable to getting the maximum co-efficient.

The table of results here given has been compiled from the data presented in the revised report of the Brake Shoe Committee, and to be published in the Proceedings of the Association. There are here given the average results of a representative series of tests of each shoe under different conditions as to speed and pressure. As the conditions in practice vary greatly the co-efficients likely to be obtained under favorable conditions will be most valuable, and, hence, these tabulated results are for the higher points of the diagrams.

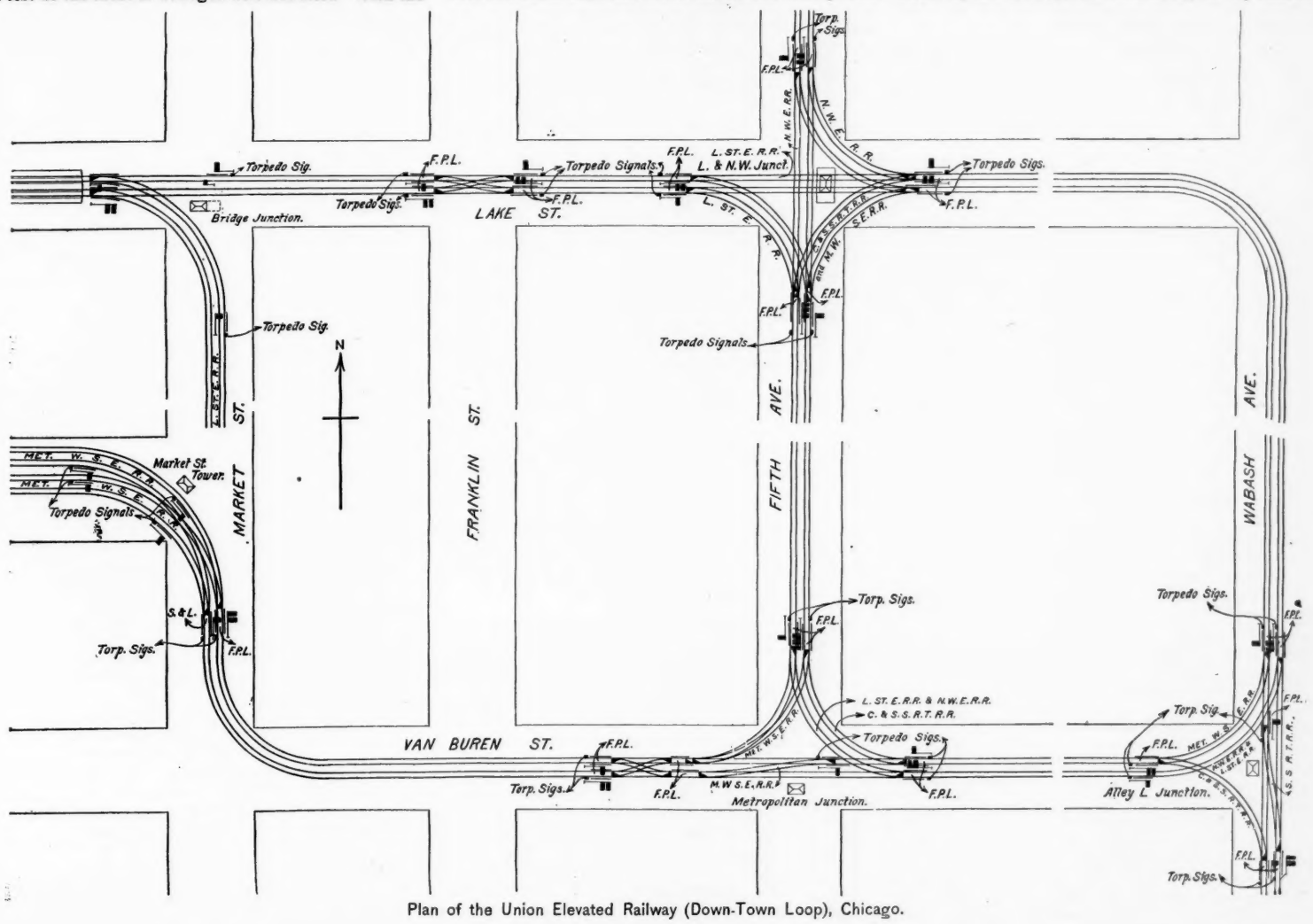
At the Master Car Builders' convention in June the members of the old committee were appointed to constitute a standing committee on tests of brakeshoes, and further tests will be made during the coming year, though the work has not yet been outlined.

Signaling and Interlocking on the Union Elevated or Down-Town Loop, Chicago.

The Alley L, Metropolitan West Side and the Lake Street Elevated Railroads of Chicago, now in operation, and the North Side Railway Company, which is preparing to build from Lake street north, have formed a company known as the Union Elevated Railway of Chicago, for the purpose of building and working a down-town loop, which will enable each of the four roads to deliver passengers in the business district. This down-town loop will consist of a double track with junctions at Wabash avenue and Van Buren, Fifth avenue and Van Buren, Lake street and Van Buren, and the necessary connecting tracks, crossovers, etc. In addition to the three junctions mentioned, the Metropolitan four-track Railroad, which now ends at Franklin street, will be changed so as to carry traffic south on Market to Van Buren, and the present interlocking plant at Bridge Junction will be enlarged to work the double cross-over at Franklin and Lake streets.

The volume of traffic over this loop will be very great. The number of trains now on the three railroads in operation is not less than 1,000 day, and with the addition trains from the North Side, this movement will be at least 1,500 trains a day.

The Alley L., Metropolitan West Side and Lake Street lines are worked right-handed, and in order that the traffic may be divided on the Loop it has been decided to work the Loop left-handed, the outer track being used by the North Side and the Lake Street, and the inner track by the Metropolitan and Alley L. By following



Plan of the Union Elevated Railway (Down-Town Loop), Chicago.

The Equipment of the Various Towers is as Follows:

ALLEY L JUNCTION.
4 levers for 6 switches and 1 torpedo signal.
3 levers for 3 F. P. locks.
6 levers for 6 torpedo signals and 6 detector bars.
10 levers for 10 signals and 3 bolt locks.
23 active levers.
5 blank spaces.
28 lever frame.
2 additional levers for 3 F. P. locks.

METROPOLITAN JUNCTION.
7 levers for 12 switches.
4 " " 8 F. P. locks.
7 " " 7 torpedo signals and 7 detector bars.
11 levers for 11 signals and 4 bolt locks.
29 active levers.
3 blank spaces.
32 lever frame.
3 additional levers for 4 F. P. locks.

MARKET STREET TOWER.
2 levers for 2 switches and 1 lock.
1 lever " 1 F. P. lock.
6 levers " 6 torpedo signals and 6 detector bars.
7 levers for 7 signals and 1 bolt lock.
16 active levers.
4 blank spaces.
20 lever frame.

L. & N. W. JUNCTION.
6 levers for 12 switches.
4 " " 6 F. P. locks.
8 " " 8 torpedo signals and 8 detector bars.
13 levers for 13 signals and 6 bolt locks.
31 active levers.
5 blank spaces.
36 lever frame.
4 additional levers for 6 F. P. locks.

BRIDGE JUNCTION.
Additions to Present Machine.
4 levers for contact rails.
2 " " 4 switches.
2 " " 4 F. P. locks.
4 " " 4 torpedo signals and 4 detector bars.
6 levers for 6 signals.
18 active levers.
6 blank spaces.
24 lever frame.

the current of traffic on the several lines as indicated by the arrows it will be seen that the crossing of the several points will necessitate the installation of a very complete system of signaling and interlocking.

The National Switch & Signal Company has the contract for planning the system to be used and for designing and installing all the work, and the General Manager of the Union Elevated, Mr. D. H. Louderbach, has charged the signal company with the duty of presenting the most complete plans necessary to the safe movement of traffic, regardless of cost of installation, and no expense will be spared to make the installation of these five plants complete and perfect.

All switches will be considered as facing-point switches and will be equipped accordingly, and since it is not advisable to provide any physical protection in the shape of a derail or skotch block, the torpedo machine will be installed and worked in the same manner as a derail and each signal will be worked in conjunction with this torpedo signal, all torpedo signals having separate levers and connections from them operating the signal.

The moral influence of this torpedo signal is considered to be very valuable, for since each torpedo machine is provided with a certain number of detonators, and since the operator in charge of the plant is required to keep a complete record of each detonator delivered to him, it is not likely that he will allow an engineer to pass a signal at danger and explode a detonator without reporting it to the proper officer, and since the engineer knows that such report will be filed against him he will not be likely to pass the signal at danger.

The machine at Fifth avenue and Lake street will be placed in a tower spanning the tracks, and will have 40 levers; the machine at Wabash and Van Buren street will be placed in a tower on the deck of the bridge and will contain 32 levers; the machine at Van Buren and Fifth avenue will be in a tower south of the south track, and will contain 36 levers; the machine at Market and Franklin streets will be in a tower between the lines of Franklin street, and will contain 20 levers; the additions to the present plant at Bridge Junction will involve 24 levers. All the signal towers will be fire-proof, the machine carried on steel frames, and the towers equipped in the most complete manner with plumbing, heating and telephone connections.

The working of traffic around the loop will be entirely in the hands of the Union Elevated Railway, and as soon as a train from either of the four lines enter the limits of interlocking all trainmen will be under the orders of the officers of the Loop. It is expected that work will commence at once at Bridge Junction, and Van Buren street and Fifth avenue. The motive power to be used on the Loop will be electricity, as on the Metropolitan West Side, there being a third rail carrying the current which is supplied to the motor through a contact shoe.

Past and Present Tendencies in Engineering Education.*

BY MANSFIELD MERRIMAN, *Professor of Civil Engineering in Lehigh University; President of the Society for the Promotion of Engineering Education.*

The present status of engineering education in the United States is the result of a rapid evolution which has occurred in consequence of changes of opinion as to the aims and methods of education in general. . . . Thirty years ago public opinion looked with distrust upon technical education. Its scientific basis and utilitarian aims were regarded as on a far lower plane than the well-tried methods of that venerable classical education whose purpose was to discipline and polish the mind. What wonderful changes of opinion have resulted, how the engineering education has increased and flourished, how it has influenced the old methods, and how it has gained a high place in public estimation, are well known to all.

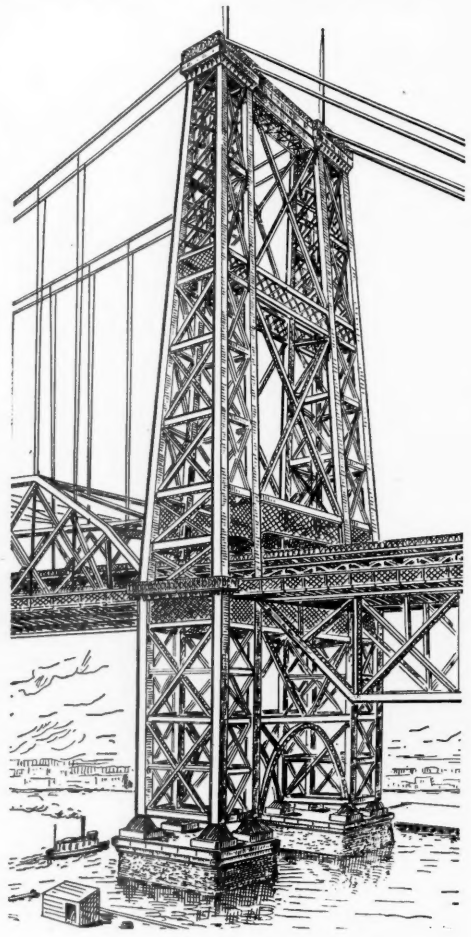
Engineering courses of study a quarter of a century ago were scientific rather than technical. It was recognized that the principles and facts of science were likely to be useful in the everyday work of life and particularly in the design and construction of machinery and structures. Hence mathematics was taught more thoroughly and with greater regard to practical applications, chemistry and physics were exemplified by laboratory work, drawing was introduced, and surveying was taught by actual field practice. Although engineering practice was rarely discussed in those early schools, and although questions of economic construction were but seldom brought to the attention of students, yet the scientific spirit that prevailed was most praiseworthy and its influence has been far reaching.

This scientific education notably differed from the old classical education in two important respects. First, the principles of science were regarded as principles of truth whose study was ennobling because it attempted to solve the mystery of the universe; and second, the laws of the forces of nature were recognized as important to be understood in order to advance the prosperity and happiness of man. The former point of view led to the introduction of experimental work, it being recognized that the truth of nature's laws could be verified by experience alone; the latter point of view led to the application of these laws in industrial and technical experimentation. Gradually the latter tendency became far stronger than the former and thus the scientific school developed into the engineering college.

*Presidential address before the Society for the Promotion of Engineering Education at the meeting in Buffalo, N. Y., Aug. 20, 1896.

The very great value of laboratory experiments, and of all the so-called practical work of the engineering school of to day, is granted by all. Principles and laws which otherwise may be but indistinct mental propositions are by experimentation rendered realities of nature. The student thus discovers and sees the laws of mechanics, and is inspired with the true scientific spirit of investigation. It should not, however, be forgotten that if such practical work be carried beyond the extent necessary to illustrate principles it may become a source of danger. The student of average ability may pass a pleasant hour in using apparatus to perform experiments which have been carefully laid out for him, and yet gain therefrom little mental advantage. Especially is this true when the work assumes the form of manual training, which, however useful in itself, is properly considered by many as of too little value to occupy a place in the curriculum of an engineering college.

The tendency toward the multiplication of engineering courses of study has been a strong one, especially on the part of the public. This has resulted in a specialization that, as a rule, has not been of the highest advantage to students. In some institutions this has gone so far that the student of civil engineering learns nothing of boilers and machines, while the student of mechanical engineering learns nothing of surveying or bridges. The graduate is thus too often apt to lack that broad foundation upon which alone he can hope to build a successful career.



Tower of the New East River Bridge.

The engraving shows the design of the towers for the new East River Bridge. We have no description other than what appeared in our issue of July 31, to which the reader is referred.

The development of the scientific school into the engineering college has been characterized throughout by one element of the happiest nature, that of hard work and thoroughness of study. The numerous topics to be covered in a limited time, their close inter-relation, and the utilitarian point of view, have required many hours per week and earnest work by each student in preparation for each exercise. The discipline of hard and thorough work is one whose influence can scarcely be over-estimated as a training for the duties of life, and in every university it is found that the activity and earnestness of the engineering students is a source of constant stimulus to those of other departments. Thus scientific and engineering education has tended to elevate the standard and improve the methods of all educational work.

The length of the course of study in engineering colleges has generally been four years, and whatever tendencies have existed toward a five-years' course have now for the most part disappeared. With higher requirements for admission, particularly in English and in modern languages, a reduction of the length of the course to three years may possibly be ventured in the future, particularly if the long summer vacation be utilized for some of the practical work, as indeed, is now the case in several institutions.

There has been and now is a strong tendency to a reduction in the length of the college year; . . . yet the fact remains that it is not good business economy to allow the buildings and plant of a college to lie idle for so large a part of the year. It is perhaps possible that in the future the summer schools may be so developed that the work will be practically continuous throughout the year, thus giving to students the option of completing the course either in three or four years.

The report of the committee on requirements for admission, which will be presented later in the session, sets forth many facts which show the tendencies now existing. Almost without exception a higher standard is demanded, both that students may enter with better mental training, and that more time may be available in the course for technical subjects. While the general line of advance is toward an increase in mathematics and in modern languages, there is also found, particularly in the central states, a demand for broader training in science. It has already been pointed out that our early engineering schools were strong in scientific training, and that the tendency had been to replace this by industrial applications. If the requirements for admission can be extended to include the elements of chemistry and physics, with some botany or zoology, the engineering student will enter with broader views, a keener power of observation and a scientific spirit, that will greatly increase his chances for success in technical studies. . . .

Having now considered some of the general elements and tendencies in engineering education, it will be well to take up the programme of studies. . . .

Mathematics is undoubtedly the most important subject in all courses of engineering study, and it has been demanded for years that it be taught with great thoroughness. This demand has been met more completely in the independent engineering colleges than in the engineering courses of the universities. Much, however, remains to be done in this direction, and probably it cannot be satisfactorily accomplished until a change in method has been effected. The fundamental element in the change of method must be, it seems to me, in a partial abolition of the formal logic of the text-books, and an introduction of historical and utilitarian ideas. Mathematics is a tool to be studied for its uses rather than for its logic or for the discipline that it can give; hence let its applications be indicated frequently and not be systematically kept out of view. If the student gains the impression that his mathematical exercises are merely intended to train the mind, his interest and his progress will usually be slow. If, however, he learns what mathematics has done in the past, how it joins with mechanism to explain the motions of the distant planets, as well as to advance the material prosperity of man, there arise an interest and a zeal that help him to overcome all difficulties.

The great advantage of numerical exercises in all branches of pure and applied mathematics, and the deplorable lack of good preparation in arithmetic have been expressed by many educators. In numerical computations the average engineering student is weak in spite of the numerous exercises in his practical work. To remedy this defect better instruction in arithmetic is demanded in the common and high schools, while in engineering colleges the teachers of mathematics should constantly introduce numerical work and insist that it be done with a precision corresponding with the accuracy of the data.

Next to importance in mathematics comes mechanics, the science that teaches the laws of force and motion. In most institutions the rational is separated from the applied mechanics, and often taught by the mathematical department. Probably less improvement has resulted in the teaching of rational mechanics during the past quarter of a century than in any other subject. That mechanics is an experimental science whose laws are founded on observation and experience is often forgotten, and the formal logic of the text-books tends to give students the impression that it is a subsidiary branch of mathematics. The most interesting history of the development of the science is rarely brought to the attention of classes, and altogether it appears that the present methods and results are capable of great improvement.

It should not be overlooked, however, that in recent years the so-called absolute system of units has been introduced into mechanics, and is now generally taught in connection with physics. Here the pound or the kilogram is the unit of mass, while the unit of force is the poundal or the dyne. Although this system possess nothing that is truely absolute, it has certain theoretical advantages that have commended its use, notwithstanding that no practical way of measuring poundals has been devised except by the action of the force of gravity on the pound. Engineers have continued to employ the pound weight as the unit of force, and the calculations of the physicist must be translated into the units of the engineer before they can be understood. The student of rational mechanics thus has the difficulty at the very outset of two systems of units, and great care should be taken that each be thoroughly understood and the relations between them be clearly appreciated by application to many numerical problems. In view of these and other difficulties and of the novelty of the subject in general, it appears that some engineering colleges do not give to rational mechanics as much time as its importance demands.

Physics in some colleges is taught by a course of five or six exercises per week, extending over a year, while in others the elements are required for admission and the regular course is correspondingly abridged. The marvelous development of electrical theory and practice

has naturally tended to make this the most important topic in the course, sometimes, indeed, to a material abridgement of mechanics, acoustics, thermodynamics and optics. Considering how great is the importance of each branch of physics, and the advances that are made every year in new directions, it may also be concluded that more time can be profitably given both to theory and to experimental work. Physics is a fundamental subject whose principles and results are of constant application in every walk of life, and a student who thoroughly covers a well-arranged course has gained a mental discipline and a scientific habit of mind that will be of greater value than the technical details of a purely engineering specialty.

Undoubtedly the most powerful tendency in engineering education has been in the direction of the development of those special technic subjects which may be grouped under the name of Construction and Design. In civil engineering this has led to plans for railroad, water supply and bridge construction; in mechanical engineering to engine and machine design: in mining engineering to projects for mine plants, and in electrical engineering to the design of dynamos and motors. These courses have been demanded by the public and by the students themselves, and have been often elaborated to an extent beyond the best judgment of teachers of engineering. To the extension of such courses there is no limit, but it is a question whether the process has not already gone too far. For instance, it would not be difficult to arrange a course of 20 or 30 exercises on water pipes in which should be discussed all the methods of manufacture and processes of laying cast-iron, wrought-iron, lap-welded, steel-riveted and wooden mains, together with a comparison of their relative economies under different conditions in different parts of the country. These lectures, however, would plainly be of such a technical nature that the advantage to the student would be slight; they would give valuable information, but little training.

In all courses in construction and design the practical limit seems to be reached when the exercises are of such a nature as to give more information and little scientific training. The aim of all education, and of engineering education in particular, should be to render the student conscious of his mental power and sure of applying it with scientific accuracy so as to secure economy of construction. Fundamental principles are hence more important than the details of a trade, and all exercises in design should be arranged so that the student may think for himself rather than blindly copy the best practice of the best engineers.

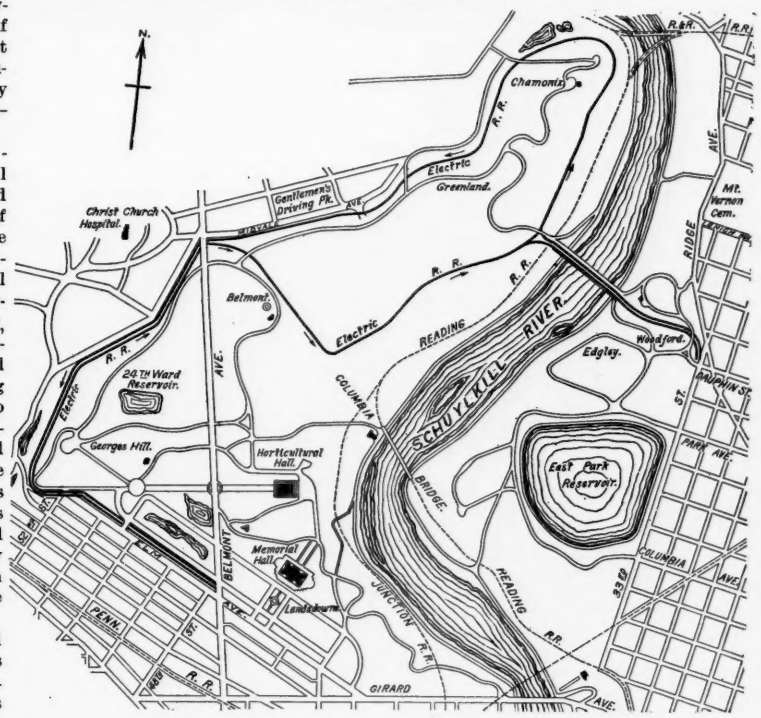
The subject of applied mechanics, which occupies an intermediate place between rational mechanics and the work in design, has been so differentiated that the mechanics of materials is now almost the only topic common to all engineering courses. The strongest line of development has here been in the introduction of testing machines and in making commercial tests. This work is of high value, although it may be doubted if the use of one or two large testing machines is as advantageous as that of many smaller ones which are designed especially to illustrate principles.

English and modern languages are generally called culture subjects, and it is well known that of all the topics in the engineering course these are the ones in which students have the least interest. The great importance to an engineer of being able to clearly and correctly write his own language can scarcely be overestimated. Further it may be said that no engineer can hope to attain eminence unless he can read German and French literature. These opinions have long been held, and, furthermore, it has been recognized that engineering students and graduates are often lacking in that general culture which the world demands as one of the conditions of success. The main line of improvement to secure better results will be, it seems to me, in partially abandoning the idea of culture and placing the instruction upon a more utilitarian basis. If English be regarded as a means to an end instead of a linguistic drill; if the aim of teaching French and German be to read fluently the language of to-day instead of laboriously to decipher the meaning of the poets of centuries ago, true zeal on the part of students will arise and a truer culture will result.

At the close of the college course the student presents a thesis showing his ability to apply the principles and rules of engineering in the investigation or design of a special problem. The tendency has been strong to abandon subjects which involve mere description or compilation, and to insist upon those that will require the student to exercise his own powers. Thus the value of the work to the student has been greatly increased, and the theses of each class are a source of stimulus to the following ones. Although the view held by some that theses should be monographs setting forth important conclusions of original investigations is one that cannot in general be realized, it is a gratification to note that each year a few theses are produced which are sufficiently valuable to warrant immediate publication.

The formation of engineering clubs among students for the discussion of the details of professional work is one of the most important tendencies of recent years. No exercise is so valuable to a student as one entirely originated and performed by himself, and the preparation of a paper which is to be presented to and criticised by his fellows ranks highest of all among such exercises. Recently there has been forced upon my notice a remarkable activity in the three engineering clubs of a certain engineering college, more than 50 papers having been read and discussed during the year by a total of about 350 students, besides a number of others read before the mathematical club. In meetings of this kind the scientific and economic questions under discussion in the engineering journals receive a detailed attention which the professor in the class-room often finds it impossible to give, while the advantage to students in expressing themselves in debate is very great.

Occasional lectures to classes by practicing engineers have been introduced in many institutions during the past decade, and with uniformly good results. In engineering education there is no conflict between theory and practice, and every professor cordially welcomes distinguished engineers to explain their great structures and achievements to his classes. It is an inspiration to students to see and hear those men who have so successfully applied sound science to economic construction, and whose influence has been uniformly to elevate the standard of the profession.



Plan of New Electric Railroad in Fairmount Park, Philadelphia.

After four years of work the engineering student receives his degree and is ready to commence the actual work of life. What the letters are that designate the degree is a matter of small importance. Moreover, if we examine the lists of alumni who graduated ten or fifteen years ago, the conviction arises that their particular course of engineering study has not been an absolute factor in determining their actual line of engineering work. It is found that graduates in civil engineering are engaged in mining, in machinery and in electricity, and that graduates in other courses are employed upon work in which they received no especial technical instructions. Thus it appears also that the particular course of engineering study is not so important a matter as students and the public generally suppose. In fact a young man thoroughly grounded in fundamental principles and well trained how to apply them, has almost an equal chance for success in all branches of engineering practice.

Looking now over the field of tendency thus briefly outlined, it is seen that there has been ever present a powerful impulse towards specialization, to which, indeed, nearly all others have been subordinated. This has demanded a higher standard of admission, great thoroughness in all fundamental subjects and a rigid adherence to scientific methods. Engineering education has had an active and healthy growth; it now enjoys the respect and confidence of the public, and its future is sure to be more influential than its past. It is not specialization that has caused its success, but rather the methods which specialization has demanded. Those methods have resulted in imparting to students zeal and fidelity, a love of hard work, veneration for the truths of science and a consciousness of being able to attack and overcome difficulties; these elements of character are, indeed, the foundation of success in life.

Looking now forward into the future it is seen that in our efforts for the promotion of engineering education a wide field for work still lies open. The student should enter the engineering college with a broader training and a more mature judgment. The present methods of instruction are to be rendered more thorough and more scientific. In particular, the fundamental subjects of mathematics, physics and mechanics are to be given a wider scope, while the languages and the humanities are to be so taught as to furnish that broad, general culture needed by every educated man. In general, let it be kept in mind that education is more important than engineering, for the number of men who can follow the active practice of the profession will always be limited. Hence let it be the object of engineering education to influence the world in those elements of character that the true engineer possesses, so that every graduate may enter upon the duties of life with a spirit of zeal and integrity, with a firm reliance upon scientific laws and methods and with a courage to do his work so as best to conduce to the highest welfare of his race and his country.

New Electric Road in Fairmount Park, Philadelphia.

The Fairmount Park Transportion Company was organized under the laws of the State of New Jersey for the purpose of constructing and operating an electric railroad in Fairmount Park, Philadelphia, until July 24, 1936. It owns the license granted to Wm. Wharton, Jr., to whom we are indebted for the information contained in this article. The capital stock of the company is $2,000,000, the par value of the shares of which is $50.

The route in the West Park (see map) begins at the intersection of Belmont and Elm avenues; thence with double track skirting the boundary of the Park, via George's Hill, to Belmont Summit; from this point a loop extends along the wooded slopes and hillsides near the Schuylkill River to Chamounix and to the lakes; thence, closely following the northern boundary of the park, it joins the double track at Belmont Summit. This line is about 7 miles long, single track measurement. There is also a branch railroad with double track beginning at Ridge Avenue, Thirty-third street and Dauphin street, passing Strawberry Mansion, crossing the Schuylkill on a steel bridge 90 ft. high and connecting with the tracks in the West Park. The road connects at its termini, in the West Park and East Park respectively, with all the city lines running to the Park. The territory traversed is beautiful and romantic.

The power-house and the car-house which are being erected on the line of the Philadelphia & Reading Railroad on the westerly bank of the Schuylkill near Columbia bridge, are well under way. They are of modern steel construction filled in with brick walls and have a large capacity. The ground needed for the power-house, car-house, passenger stations, etc., was provided by the Park Commissioners without rent or other charge. The steam engines, boilers, electric generators, and all other machinery and appliances are of the most approved types.

The fares for the round trip in the West Park and on the branch line from the East Park over the bridge to its junction with the track in the West Park will each be five cents. From May to November, both inclusive, the cars are obliged to be run by the terms of the ordinance but there is no obligation to run any cars during the other five months.

The tracks will be laid with steel T rails, 90 pounds per yard. No grade crossings will exist at any roadway, bridle path, or footpath; the tracks over the bridge will be entirely separated from the carriage and foot travel and all dangerous places will be guarded by fences. Sixty, eight-wheeled cars will be provided at the outset, each having a seating capacity for one hundred persons. Four, G. E. 1000 motors will be placed on each motor car, and will be of sufficient power to enable it to draw a trailing car of equal seating capacity.

The whole of the line has been graded, for a part of the distance there was very heavy rock cutting; about one half the track has been laid; a number of the bridges have been built, and the piers and abutments for the large bridge over the Schuylkill River are under way. The J. G. Brill Co. are building the 60 cars, which are almost ready for delivery; the General Electrical Company are furnishing the generators, motors and other electrical equipment; Robert Wetherill & Co. are making the engines and boilers; William Wharton, Jr., & Co., Incorporated, are providing all the materials and labor for the tracks, and Pepper & Register are furnishing all the labor and materials for the electrical line work. George S. Gandy is President and E. H. Hults is Secretary and Treasurer of the company. The directors are: G. S. Gady, James Rawles, A. L. Register, F. S. Dickson, J. H. W. Chestnut and J. W. Henderson, of Philadelphia, and A. R. Kuser, of Trenton.

New Electric Road from Cleveland to Painesville.

The new electric line of the Cleveland, Painesville & Eastern Railroad Company, running from Cleveland to Painesville, through Collamer, Euclid, Wickliffe, Rush Road, Willoughby, Reynolds, Mentor and Heisley, has been completed and cars will be running regularly over the route in a short time. The company was organized under the general railroad act of the state of Ohio, with a capital stock of $500,000. The actual roadway extends from Euclid avenue, Cleveland, to Painesville, but cars are to run into the Public Square in Cleveland, making a total of 30 miles of road. The Chagrin River has been bridged at Willoughby with a steel structure which has

cost $37,500. The power-house has been constructed adjacent to the Nickel Plate Railroad at Willoughby and uses the water from the Chagrin River for motive power. Including real estate, water connection, etc., the complete cost of the power-house is $57,622. A substantial brick car-house and shop have also been erected at a cost of $9,000.

The track is laid with 68-lb. Wharton girder rails and is constructed in a substantial manner with stone and gravel ballast. The line is provided with 30 ft., comfortably upholstered, passenger coaches, built by the J. G. Brill Co., of Philadelphia, and equipped with G. E. 1,500 motors, electric brakes, etc. The estimated earnings for the first year are $18,000, or a trifle over 3 per cent. on the capital stock.

The line parallels the Lake Shore & Michigan Southern Railroad, and the fares on the electric road are from one-half to two-thirds of the amount charged by the steam road.

Notes of the Presidential Campaign.

Measures have been taken to educate the employees of Chicago street railroads on a pretty extensive scale. The companies are distributing printed matter, and some of the officers are organizing meetings at which addresses and discussions can be had. The purpose is to let the men have every opportunity, not only to be talked to, but to talk.

The National Switch & Signal Co., of Easton, Pa., is using pay envelopes on which is printed the following endorsement:

THIS CONTAINS
SOUND MONEY.
IT WILL BUY 100 CENTS WORTH OF GOODS FOR
EACH DOLLAR.

DO YOU PREFER 53-CENT DOLLARS FOR SAME LABOR?

In this envelope is enclosed the following letter:

"Recognizing, as we ever must, the inalienable right of every citizen to cast his ballot in accordance with his own opinion and with that freedom of action which is the privilege of every person possessing the right of franchise, and having due regard for the political faith of each employee of this company, we consider it proper to draw your attention to the questions of public policy which have arisen through the promulgation of the several platforms of the conventions which have lately been held.

"We believe that the general welfare of all classes and the greatest good to the greatest number will be secured by an adherence to the standard of money under which this country has secured its place among the nations of the world.

"The mere proposal to inaugurate the system of free and unlimited coinage of silver at a ratio of 16 to 1 has seriously affected our business. Railroad companies which were satisfied to make improvements under the existing system, paused and waited at the first blast from the free-silver trumpet and so long as there is any possibility of the free and unlimited coinage of silver, just so long will the railroads cease improvement.

"We speak now from knowledge; we have brought the question on down to the narrow but exceedingly interesting point of self-interest. For, so long as we depend upon the requirements of the railroads for the business which enables us to find employment, we must consider the effect that the adoption of this new policy may have upon the earnings of the railroads.

"When we consider that the value of the railroads in this country is ten times greater than all the money of this government; when we consider that over 1,200,000 persons are directly employed by the railroads; when we consider that the allied industries which are dependent for their success upon the operation of the railroads, together with the business of the railroads, represents an industry greater than all other industries combined, we may well ask how free silver may affect railroad values.

"It is possible that we are mistaken in our belief that the general good will not be promoted by the free and unlimited coinage of silver; but there is not a possibility of a doubt about its affecting the business of this company disastrously, for our business is directly and seriously impaired by the same cause that depreciates railroad values. And, since railroad values are represented by gold; and, since the value of the railroads is ten times the total money of this country, gold must be our natural standard. It follows, then, that if railroad values fall, as they did at the first cry for free and unlimited silver, we cannot hope for prosperity in our business if silver dominates."

Summer Meeting of the Eastern Association of Officers in Charge of Car Service.

The "Alexandria Bay" meeting of this Association on the 12th of August was duly held, but at St. Lawrence Park, some miles across the water from Alexandria Bay. Fortunately none of the members were led astray, and the gathering at the St. Lawrence Park Hotel was in full numbers.

As this was the annual meeting officers were chosen. Mr. A. F. Currier, of the Old Colony, was re elected President, and Mr. T. M. Magiff, of the Central Vermont, Secretary and Treasurer. Mr. T. S. Bell, of the Pennsylvania, and Mr. L. A. Anthony, of the Boston & Albany, were elected to the Executive Committee.

The first question discussed and that which occupied most of the time was "The Light Weighing of Freight Cars." This subject had been treated by Mr. Bell in an elaborate paper read before the Car Accountants' Association at Cleveland last June, but there had been little opportunity there for discussion. Accordingly the matter was talked over in all its bearings by Mr. Burnham, of the Fitchburg; Mr. Rosevear, of the Grand Trunk; Mr. Bell, Mr. Currier and others. The discussion tended to confirm the view that the average freight car decreases in weight with considerable rapidity, and that it should be reweighed and restenciled at regular intervals. The point was made, however, by Mr. Brennan, of the Buffalo, Rochester & Pittsburgh, and confirmed by Mr. Bell, that coal cars do not lose weight as rapidly as box cars, or even flats and gondolas, and it was suggested that possibly enough coal-dirt was ground into the car to keep its weight up.

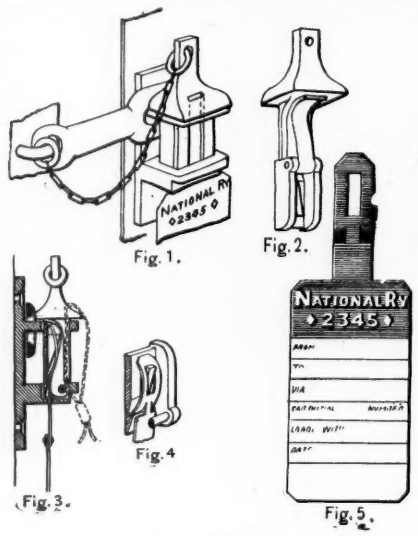
The discussion was concluded by the adoption of a resolution to the effect that cars should be relight-weighed six months after they are built, and every year thereafter. Further, that all cars, home and foreign, should be light-weighed after passing through shops.

The second subject discussed was the relation of the railroads to the private car lines, especially in the matter of junction reports. The ordinary junction reports exchanged between railroads are made upon forms prepared by the reporting company, which naturally are made as simple as possible. The private car lines, however, are obliged by the railroads to supply their own forms. These are usually printed in the same style as the railroad forms and give the car number, date and name of the road to which delivery is made. Occasionally, however, an ingenious car accountant will ask for more, and recently one of the private car lines has been sending out junction reports, with columns calling for the point of delivery, points of shipments and destination and route.

It will be seen from the discussion that few roads are giving the information called for, and, though no formal resolution was passed, it was the sense of the meeting that the railroads should not be called upon to give the private car lines more information than they gave each other, and further that the private car lines should supply junction report forms printed upon United States postal cards. This latter request would tend to show that the railroads do not care to bear entirely alone the cost of the recent postal decision.

Upshur's Car Seal.

The engravings herewith show a device for sealing and locking freight cars, made by the Upshur Seal and Lock Co., Richmond, Va. The locking is accomplished by the narrow upward projection on the tin tag shown in Fig. 5, which, being inserted at the bottom of the pin, after the latter is in position, and pushed upward, catches on a projection as shown in Fig. 4, so that it cannot be pulled out until after the pin or lock has been withdrawn from the staple and opened, as shown in Fig. 2; and this withdrawal cannot be accomplished except by breaking off the tin tag. The construction and operation of the apparatus is best shown in Fig. 3. The pin or lock being in place, as shown in Figs. 1 and 3, the sealing clerk forces the tag upward into position and it is held there by the projection within the pin, as before stated. Fig. 4 shows the projecting portion of the tag broken off, in which condition it allows the door to be unfastened. The tag can be used as a card manifest. The dotted lines



Upshur's Car Seal.

in Fig. 3 show the position of a common lead and wire seal, which may be used when tags are not available.

It will be observed that there are no springs in this lock, the shape of the slotted tin and of the recess which receives it providing the necessary automatic locking action. The only part requiring to be broken being the tin, there is no soft metal about the seal. The makers claim that it is impossible to seal imperfectly and that the lock cannot be picked without completely destroying the locking portion of the tag. The operation of sealing is easy under the most difficult conditions of weather, darkness or position of the car. The distinguishing initials or numbers on the tin seal are embossed so that they cannot be easily defaced or rendered illegible. The card manifest and the seal record being identical, the keeping of records is as simple as possible.

Train Accidents in the United States.

COLLISIONS.

REAR.

3d, on Pennsylvania line, near Thompson's, Pa., an empty engine ran over a misplaced switch and into a freight car standing on a sidetrack. Engineman and fireman injured. The switch was misplaced by boys who were afterwards arrested.

15th, 1 a. m., on Cleveland, Columbus, Cincinnati & Indianapolis, near Veedersburg, Ind., a freight train descending a grade broke in two, and the rear portion afterward ran into the forward one, wrecking 11 cars. Two tramps were injured.

15th, on Philadelphia & Reading, at Shamokin Pa., a freight train descending a grade broke in two, and the rear portion afterward ran into the forward one, wrecking 22 cars. One of the brakemen on the rear portion of the train while attempting to stop the cars fell to the ground, and those remaining on the cars were unable to control them. The engineman, seeing this, slackened his speed at Shamokin, believing a collision at that point preferable to the risk of running farther, there being a descending grade 11 miles long ahead of him.

16th, 1 a. m., on Lehigh Valley, at Buffalo, N. Y., a freight train broke in two, and the rear portion afterward ran into the forward one; one brakeman injured.

16th, on Chicago & Alton, at Godfrey, Ill., a freight train descending a grade broke in two, and the rear portion afterward ran into the forward one, wrecking one car. A brakeman was killed.

And 9 others on 8 roads, involving 2 passenger and 11 freight and other trains.

BUTTING.

2d, on Chicago & Alton, near Girard, Ill., butting collision of freight trains; one engineman and one fireman injured.

9th, on Norfolk, Virginia Beach & Southern, near London Bridge, Va., a passenger train ran over a misplaced switch and into the head of another passenger train standing on a sidetrack, badly damaging both engines.

11th, on Chicago & Northwestern, near Logan, Ia., butting collision between a westbound excursion train of 16 cars, heavily loaded, and an eastbound freight train; the baggage car and the first passenger car of the excursion train were telescoped and badly crushed and 25 passengers and one employee were killed and 41 passengers and 2 employees injured, all in these two cars. The conductor and engineman of the excursion should have waited at Logan for two regular eastbound trains, a passenger and a freight. They waited for the former, but forgot about the latter.

12th, on Chicago & Northern Pacific, at Altenheim, Ill., an excursion train ran over a misplaced switch and into the head of a train of empty passenger cars, doing considerable damage. Five passengers were killed and 9 injured.

15th, on Chicago, Burlington & Quincy, near Quincy, Ill., a butting collision between a switching engine and a freight, wrecking both engines. One engineman was killed, both firemen fatally injured and the other engineman badly hurt. It is said that the collision was due to a misunderstanding of telegraphic orders.

15th, on Philadelphia & Reading, near Willow Grove, Pa., butting collision between a northbound regular passenger train and a southbound train of empty passenger cars, making a bad wreck, which blocked the road all day. Three trainmen and 3 passengers were injured. The extra train forgot about the regular.

27th, on New York, New Haven & Hartford, near Mt. Carmel, Conn., butting collision of freight trains; 2 rainmen injured. One of the trains, an extra, had encroached upon the time of the other, which was a regular.

And 6 others on 6 roads, involving 1 passenger train and 11 freight and other trains.

CROSSING AND MISCELLANEOUS.

9th, on Chesapeake & Ohio, at Bardwell, Ky., collision between a gravel train and a freight, wrecking 18 cars; 2 trainmen injured.

11th, at Dyer, Ind., a freight train of the Louisville, New Albany & Chicago ran into a freight of the Elgin, Joliet & Eastern at the crossing of the two roads, derailing several cars and damaging the station building. The telegraph operator was injured.

24th, 11 p. m., on Georgia & Alabama, at Rhine, Ga., a passenger train ran into a freight train which was entering a sidetrack, but had not fully cleared the main line, damaging the engine and several freight cars. The engineman of the passenger train was injured by jumping.

30th, 6:48 p. m., at the crossing of the West Jersey & Seashore and the Atlantic City Railroad, near Atlantic City, N. J., an express train of the latter road ran into a special excursion train of the former, crushing two or three cars and overturning the engine of the express. Forty-five passengers on the excursion train were killed or fatally injured; the engineman and baggageman of the express were killed and over 50 passengers on the excursion were badly injured. The express approached the crossing at high speed, having traversed the last 3 miles in about 3 minutes, and the engineman did not apply the brakes until too late, probably not until he was within 1,000 ft. of the crossing, or perhaps less. This accident was reported in the *Railroad Gazette* of Aug. 7 and 14.

And 4 others on 4 roads, involving 2 passenger and 4 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

20th, on Union Pacific, Denver & Gulf, near Vasquez, N. Mex., a passenger train was derailed at a point where the sleepers had become insecure and 2 passenger cars were ditched.

21st, on Chicago & Texas, near Murphysboro, Ill., the rear car of a passenger train broke through a trestle and fell to the ground below. Fifteen passengers were injured.

26th, on Baltimore & Ohio Southwestern, near Salem, Ill., a freight train was derailed by a broken rail and 16 cars fell through a trestle. Two tramps were injured.

29th, 3 a. m., on Terre Haute & Indianapolis, near Crawfordsville, Ind., a locomotive on which the supervisor was going over the road to look for washouts, was derailed at a weakened bridge and the conductor, fireman and brakeman were killed. The supervisor and the engineman were injured.

DEFECTS OF EQUIPMENT.

2d, on Louisville & Nashville, near Hartzelle, Ala., the engine of a freight train was wrecked by the explosion of its boiler, and 18 cars were derailed; 4 of them were wrecked; engineman, fireman and brakeman killed and one brakeman injured.

3d, on Peoria, Decatur & Evansville, near Newton, Ill., a freight train running at high speed broke through a pile bridge and 8 loaded cars were wrecked. It is said that the train was derailed by a broken truck. One brakeman was badly injured.

4th, on Wabash road, at Worden, Ill., a passenger train was derailed by the breaking of a locomotive tire and three cars were ditched. The engineman, fireman and 3 passengers were injured.

7th, on Baltimore & Ohio, near Osceola, Pa., a freight train was derailed by the breaking of the flange of a wheel of a coal car, and 4 cars were wrecked. Several tramps were injured.

8th, on New York, New Haven & Hartford, near Westerly, R. I., a freight train was derailed by a broken wheel and 12 cars were wrecked. A brakeman was fatally injured.

12th, on Baltimore & Ohio, near Hyndman, Pa., a freight train was derailed by a broken wheel and 2 cars were wrecked. The conductor was injured.

24th, 5 a. m., on Missouri Pacific, near Lamar, Mo., a freight train was derailed on a bridge by a broken axle and 16 cars, with one span of the bridge, 152 ft. long, fell into the Big Muddy River. A boy stealing a ride was killed.

And 6 others on 3 roads, involving 6 freight trains.

NEGLIGENCE IN OPERATING.

4th, on New York, New Haven & Hartford, at Middletown, Conn., the rear car of a passenger train was derailed by the premature movement of a switch as the train passed over it. One passenger was injured.

17th, on Pittsburgh, Fort Wayne & Chicago, at Beaver Falls, Pa., a stock train running over a bridge which was undergoing repairs was allowed to run too rapidly and the engine broke through the floor and fell about 8 ft., where it lodged in the iron trusses of the bridge.

And 5 others on 5 roads, involving 5 freight trains.

UNFORESEEN OBSTRUCTIONS.

1st, 12:10 a. m., on Louisville & Nashville, near Slaughtersville, Ky., a passenger train was derailed and 5 passengers were injured. The engine struck a cow and threw it against a switch-stand; this moved the switch-rails slightly and caused the derailment.

12th, on Baltimore & Ohio, near Washington, Pa., a freight train was derailed in a tunnel by earth which had fallen upon the track and the conductor was killed.

13th, on Lehigh Valley, near White Haven, Pa., a passenger train was derailed by running over a cow, and the engine fell down a high bank. Three cars were overturned. The engineman was killed and 19 passengers were injured. The fireman was fatally injured.

15th, on Baltimore & Ohio, at Port Perry, Pa., a switching engine was derailed at a washout and fell into the ditch. A man riding in the cab was killed and the engineman was injured.

21st, on Cincinnati, Portsmouth & Virginia, near Rocky Ford, O., a mixed train was derailed by running into a washout, and the engine and 5 freight cars were wrecked. The engineman was injured.

22d, 1 a. m., on Missouri Pacific, near Leoti, Kan., passenger train No. 8 was derailed at a washout and the running gear of the cars was badly wrecked, though the bodies were not overturned. The fireman was killed and one passenger was injured.

24th, on Cincinnati, Hamilton & Dayton, near Dayton, O., a freight train was derailed at a washout and 23 cars were wrecked, some of them falling into a canal. A tramp stealing a ride was drowned.

25th, on Southern Pacific, near Niles, Cal., a freight train was derailed by a piece of steel which had been either maliciously or accidentally left upon the rail and the engine and a number of cars fell down a high bank. The engineman, fireman and one brakeman were injured.

And 9 others on 8 roads, involving 4 passenger and 5 freight and other trains.

UNEXPLAINED.

14th, on Wisconsin Central, at Oshkosh, Wis., the engine of a freight train was derailed on the bridge over the Fox River and fell into the stream below. The engineman was injured.

16th, on Grand Rapids & Indiana, near Page, Mich., the engine of a passenger train was derailed and ditched; engineman and fireman injured.

17th, on Nashville, Chattanooga & St. Louis, near Nashville, Tenn., the engine of a freight train was derailed and fell down a bank; engineman killed.

25th, on New England road, near Putnam, Conn., a freight train was derailed, making a considerable wreck. The rear brakeman, Albert S. Burnham, was thrown off from a car, and sustained fractures of two ribs, besides being otherwise badly bruised, but nevertheless went back with a red light sufficiently far to warn the following train.

26th, on Southern Railway, near Salisbury, N. C., a freight train was derailed and a tramp was killed.

28th, on Texas & Pacific, near Kildare, Tex., a freight train was derailed and 11 cars were ditched; one brakeman injured.

And 18 others on 17 roads, involving 6 passenger and 12 freight and other trains.

OTHER ACCIDENTS.

8th, on Chicago & Northwestern, near Lathrop, Mich., locomotive No. 13, drawing a freight train, was wrecked by the explosion of its boiler; engineman killed, fireman and brakeman scalded.

And 2 others, involving 2 passenger trains.

A summary will be found in another column.

The Heilmann Locomotive.

Few contrivances built for locomotive purposes during the past few years have been forced into more prominence than the Heilmann locomotive, the "Fusee" (Rocket), with which experiments in traction have been made on the Western Railroad of France.

In a recent article on the subject by M. H. de Grièges, published in the *Transactions* of the French Society of Civil Engineers, the author states that, taking into account all the losses between the indicated power of the cylinders and that developed at the tires, the efficiency of the whole mechanism ranges from 65 to 70 per cent. He then goes on to say that these same tests have shown that the internal resistances of the machine are comparable with those of ordinary railroad cars and are very much less, especially at high speeds, than those of steam locomotives. Speeds as high as 67 miles an hour were obtained and some express trains were hauled in ordinary service.

However, in spite of this, it is not claimed that this first locomotive was perfect, and the promoters would be far from comparing it with the more powerful engines owned by every company. This machine was built to develop 600 H. P., while there are a number of steam locomotives that at times develop more than 1,000 H. P. Then, too, some of the working parts were too small or weak. The bearings of the engine, for example, were too small, requiring an extra amount of oiling and the constant attention of a greaser. There are many other details that leave much to be desired; but this locomotive has run 1,250 miles without any accident.

The Electric Traction Co. and the Western Railroad have decided to build two new locomotives on the same principle, but varying in the details of construction, and, instead of limiting the power to 600 H. P., it will be adapted to the actual conditions of railroad service. On all of the French express locomotives an attempt has been made to increase the grate area as much as possible, but the deep fireboxes set a limit to this surface, and the engineers, on reaching the end of their resources in this direction, turned to an increase of steam pressure and the use of the compound system.

A careful study of the possibilities of these new electric locomotives has brought out the fact that a grate area of 36 sq. ft. can be obtained, while the ordinary French high-speed locomotive has no more than from 25 to 26 sq. ft. as a maximum. This is an increase of about 50 per cent. in the amount of steam available, for with a proportional increase of fuel consumption the development of from 1 400 to 1,500 H. P. may be expected instead of the 1,000 H. P. of present practice.

Figs. 1 and 2 show the Fusee and the engines under construction. The boiler of the Fusee is of the Lentz type and will be replaced in the new engine by an ordinary locomotive boiler, with a Belpaire firebox. The horizontal 600-H. P. compound engine placed transversely of the locomotive cut off communication between the engineer and fireman. In the new type, a vertical engine of from 1,300 to 1,400 H. P. will be used. There was but one electric generator on the Fusee, while there will be two on each of the new ones, as well as a 30-H. P. exciter.

The whole of the apparatus will be set on a rigid frame which is itself to be carried on two 8-wheeled bogies; and the electrical energy that will be generated will be distributed to eight motors, each keyed to its own axle. And finally the new machines are to be arranged to run in both directions.

This brief description will serve to indicate that the principal modification will be in the use of a new type of steam engine. That on the Fusee had the defects mentioned, but it was in perfect balance. In the new locomotives it was considered to be out of the question to use a similar engine, and yet it must be mathematically balanced, for it is easy to imagine what the results would be if an attempt were made to carried an unbalanced vertical engine on springs over a railroad. There was a small 25-H. P. two-cylinder vertical motor on the Fusee, with cranks standing at 180 deg., which shook the whole locomotive. Hence great pains have been taken to balance the new engines and this has been done by using a six-cylinder vertical machine whose general arrangement is shown in Fig. 4.

This engine consists of two groups of three cylinders each, the cranks of each group standing at angles of 120 deg., the group ABC being symmetrical with the group $A'B'C'$ relatively to the center line MN dividing the two (Fig. 4), so that the engines are perfectly balanced and there can be no vertical disturbances due to the inertia of the reciprocating parts.

The author adds that the Western Railroad Co., not wishing to commit itself to any one system of electric traction, will equip one of its branches with an electric conductor and there make some experiments with other motors. The line to be thus used will be the one running from St. Germain Ouest to St. Germain Grand-Ceinture, a distance of about 2¼ miles. It is expected that with this trolley line some very conclusive experiments will be made as well as with the locomotives of the Fusee type.

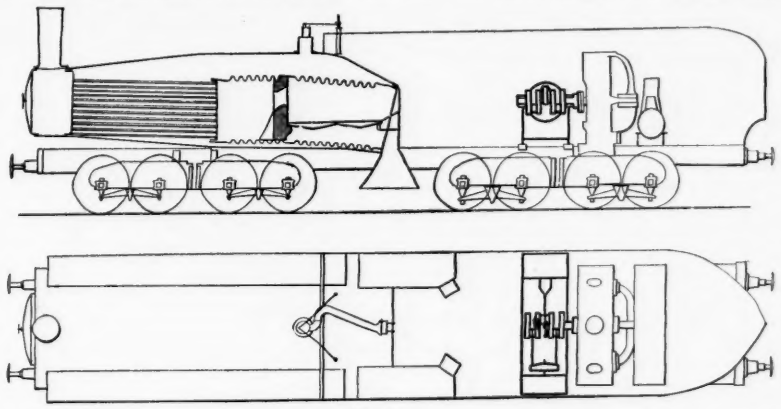


Fig. 1.

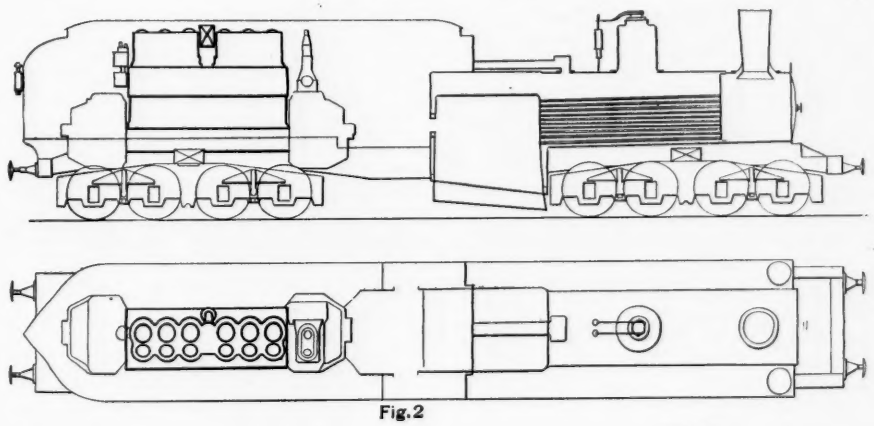


Fig. 2

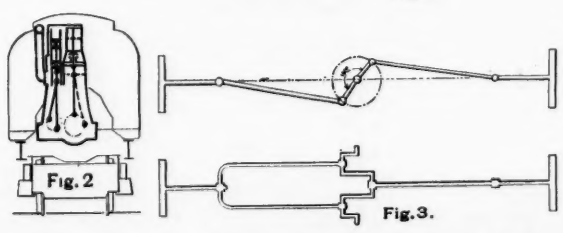


Fig. 2

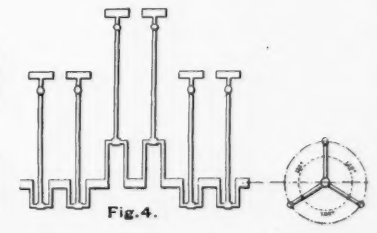


Fig. 3.

Fig. 4.

The Improved Heilmann Locomotive.

The Antofagasta & Bolivia Railroad.

The affairs of the Antofagasta & Bolivia Railroad, and of the Compañia Huanchaca de Bolivia (silver mining and reduction), which are so intimately related as to necessitate consideration together, fail to present the usually favorable showing for the past year (1895). The gross income of the railroad was $4,957,965.01 (Bolivian money), against $5,582,280.15 in 1894, being a decrease of $624,315.14. Operating expenses were reduced from $3,487,963.54 in 1894 to $3,035,766.01 in 1895. The economies were effected as follows: In motive power, $201,302; in handling traffic, $52,786.12; in maintenance of way, $303,487.69. Against these were increases on general administration of $57,764.36, and on maintenance of equipment of $47,616.92; the net decrease, therefore, being $452,194.53. In short, the net income for 1895 works out at 38.75 per cent., against 37.52 per cent. in 1894. After meeting the interest account on bonds the loss for 1895 amounts to £9,409, against £36,178 for the previous year.

This loss is borne by the Compañia Huanchaca de Bolivia, which unfortunately records serious decrease in revenue. This was due to a sudden influx of water in the lower levels of its mines. The amount of water lifted from three shafts increased from 1,172 tons daily in 1894 to 2,200 tons in 1895, and this does not suffice to keep the lower levels clear. An elaborate pumping plant of large capacity is now being installed, to help pay for which the September dividend was passed, the amount paid in dividends for the year having been $640,000 in gold.

Accompanying the inflow of water there has been a large production of carbonic acid gas in the mines, due to the action of the acid waters on the limestone, but the ventilating plant has proved adequate to deal with the difficulty.

Considerable improvement is being made in the smelting plant, two new American circular water jacket furnaces, 48 in. in diameter, being in course of erection, together with modifications of old furnaces, and a new installation for the treatment of the old tailings, of which a large accumulation exists from the early workings of the Huanchaca mines.

A New Russian Steel Works.

At Bogolowsky, in the government of Perm, in eastern Russia, a new iron and steel works has lately been completed. The works comprise four blast furnaces, three 15-ton Martin open-hearth steel furnaces, a large rolling-mill, an iron foundry, an engineering shop and a plant for the making of refractory bricks.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
Published Every Friday,
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

On another page we print an excellent address by President Merriman as President of the Society for the Promotion of Engineering Education. And, by the way, it is worth the reader's while to stop and consider that Society for a moment. It was organized only three years ago, and last year it had 188 members, representing practically all the engineering schools of the country—and those are many. These men meet every year, sacrifice much of their vacation and travel far, to read and hear and discuss papers bearing on the education of the youth of the nation for the various branches of engineering. They do all this with uncommon zeal, ability and thoroughness. Surely the country where such a thing is possible as this active, working society of those whose business it is to educate engineers, is in no danger of losing command of material forces. We have, however, grave reason to doubt the advance in strength of our nation on the moral side, and, after all, this is the only enduring strength. Most of the trouble in which we have been plunged the last three years has come through the ignorance, the materialism and the moral dullness of the people, high and low. Their mental activity is a misfortune rather than a blessing when it is not guided by knowledge of human experience and by sound principles. One of the best things that we find, therefore, in Professor Merriman's address is the serious injunction which runs all through it to give the boys *character* and let the information wait, if it must.

July Earnings.

But for the continued heavy movement of grain through July, gross earnings for that month might have shown a decrease. As it is the rate of increase is but 4.02 per cent., as compared with the same month in the previous year. This is nearly the lowest percentage of increase reported for any month this year, and is considerably less than the June rate of increase, 8.29 per cent. The compilations of the *Financial Chronicle* give the earnings of 131 roads operating 97,357 miles, the total being $41,617,094, or $1,610,012 more than the earnings reported for a somewhat less mileage in July, 1895. The total of the month is about $7,000,000 more than in July, 1894, but in that month the railroad strike of Chicago brought about an almost complete suspension of traffic on a number of important roads; the earnings for July, 1896, were about the same as the July earnings in 1893, but that was the first and most severe year of the financial disturbance.

Nearly half the roads reporting show losses; and the earnings for the first weeks of August, as reported so far, show decreases on most roads, the Northwestern lines still being able to report increases. All these figures reflect the uncertain outlook for business, and apparently we must look for poor returns for some months at least. So that while earnings are not yet within five millions a month of the figures reported four years ago, the railroads are threatened with another heavy falling off

The first important rate reductions of the year were made in July, one having a serious effect on earnings. This was the action of the Joint Traffic Association in reducing the corn rate from the Missouri River to the seaboard; the other instance was the rate war between the Seaboard Air Line and the Southern, which, at first confined to these two roads, at last threatened to involve all the Southern lines until summarily terminated by the power of the courts. The reduced corn rate has been successful in inducing a phenomenal movement. The receipts of corn at the Western primary markets were 13,608,000 bushels in July last, and were only a little over five million bushels in July, 1895. Wheat also continues to go forward in large quantities. Receipts at Western markets were over 17 million bushels, as against eight million bushels in July, 1895, and so far this year have been over 78 million bushels against 46 million bushels for seven months in 1895. But this traffic, as in previous months, continues to chiefly benefit the spring wheat carrying roads, which have all had large gains.

Five of these lines report an aggregate increase of over $1,000,000 in earnings for the month. The Chicago, Milwaukee & St. Paul, the Great Northern and the Canadian Pacific have each gained more than $250,000; the Northern Pacific, $116,000, and the "Soo" road, $93,000. Other large increases are those of the Missouri Pacific, the Chicago, Rock Island & Pacific, the Illinois Central and the Norfolk & Western, each having a gain of over $100,000. The gains reported by the two last-named roads are explained by an increase in mileage by one company, and by comparison being made with the period of the coal miners' strike on the lines of the other. The Baltimore & Ohio also reports an increase of $148,000. The largest decreases are on roads in the South and in the Middle West. The "Big Four" has a loss of $96,000; the New York Central, $60,000; the Louisville & Nashville, $54,000, and the Southern, $92,000, on an increase of 155 miles of operated road.

A Presidential Candidate on Railroad Rates.

The one quality above all others which the people of the United States require in their President is common honesty. Abraham Lincoln bore no name or title which was so dear to his countrymen as that of *honest* Old Abe. Within recent experience a brilliant and most attractive man has failed of election to the presidency because a large number of the people of the United States believed that he was dishonest. Within recent years a man singularly devoid of the qualities which make a man popular has been twice elected President of the United States because the mass of his fellow countrymen, regardless of party, believe that he is honest. The political history of our country abounds in records of able and ambitious men who have failed of their highest ambition because the people doubted their honesty. It would seem as if any presidential candidate, however inexperienced, however unfamiliar with simple and sincere motives and however vain, would have the intelligence to at least simulate honesty if he has it not; but if a man is not fundamentally honest he cannot always seem so, even if he is a great actor.

In the speech which Mr. Bryan made the other night in Madison Square Garden, New York, occurs this sentence: "Railroad rates have not been reduced to keep pace with falling prices." Of course Mr. Bryan knew better than this He has, we understand, been something of a railroad lawyer, although perhaps not very successful or much trusted, and he is somewhat familiar with the course of railroad rates for the last one or two decades. If he is not he ought to be, for he undertakes to instruct the people. It is not a great exaggeration to say that every intelligent school boy knows that railroad rates have fallen steadily and fast in the last 20 years until much more than half the railroad stocks in the United States pay no dividends and the average return on all railroad investments is 3.3 per cent. (Poor says it is but 2.89 per cent., but we use the figure of the Interstate Commerce Commission.)

And now let us see what the course of rates has been. The average ton-mile rate of *all* the railroads of the United States, going back as far as 1873, is not available in any returns that we know of. But we have the means of approximating to the average rate. The "Statistical Abstract of the United States," compiled and published by the Treasury Department, gives the rate per ton per mile for 18 of the chief railroads in 1873 as 1.988 cent. This is too low, for the 18 roads include all the great lines on which the traffic was heavy and rates low and does not include the mass of the lines of thin traffic and high rates; but we will assume for the moment that the 1873 rate was 1.988. In 1894 it was by the Interstate Commerce Commission 0.86 cent. (Poor says it was 0.851, but we will use only official figures.) The fall from 1873 to 1894 was 56.7 per cent. If the freight of 1894 had been carried at the rates of 1873 the railroads would have earned $906,000,000 more than they did earn; their total receipts would have nearly doubled. Of course this supposition is absurd, for only the fall in rates made possible the enormous development of our country, and the great tonnage which was carried in 1894.

Let us take two individual railroads which go to make up one of the great lines from the West to the ocean. The average rate on the New York Central Railroad is, of course, lower than the average for all the railroads in the country. In 1873 the average rate per ton per mile on that road was 1.573 cents. In 1895 it had fallen to 0.74 cent; that is, the decrease had been about 53 per cent. On the Lake Shore the average rate per ton per mile in 1873 was 1.297 cent and in 1895 it was 0.566 cent. In this case the decline has been over 56 per cent.

But these are general averages; they take into account *all* kinds of freight. We have no comparison of prices of all produce, merchandise and commodities in the years 1873 and 1894, but no one claims, we suppose, that they have fallen 50 per cent. From the "Statistical Abstract" we take the following export prices at New York, these being the average price of the commodities at the time of export:

	1873.	1895.
Bacon (cents)	8.8	8.7
Cheese "	13.1	9 1
Eggs "	26.6	16.8
Tobacco "	10 7	8.7
Cotton "	20 14	7.44
Butter "	21.1	16.4

But we may take some special figures of perhaps more immediate significance to the farmers. In 1873, the average rate per bushel on wheat from Chicago to New York by lake and rail was 26.9 cents per bushel. In 1895 that rate had fallen to 6.95. All-rail the rate of 1873 was 33.2; and the rate of 1895 was 12.17. That is, the decline by lake and rail amounted to 74 per cent.; by all-rail it amounted to 63 per cent. These are the figures of the U. S. Treasury Department. We get from the New York Produce Exchange the following average annual prices of wheat: 1873, $1.55½; 1895, 68⅛; per cent of decline, 56. The rail rate on corn fell from 1873 to 1895, 50 per cent; but the New York price fell in the same time from 64 15/16 cents to 47¾ or 26 per cent. From the price of 1873 to the price of to-day the decline is 54 per cent.; but the decline in the rail rate is 62½ per cent. The rate on provisions from Chicago to New York fell 50 per cent. in the same years, but the price of mess beef fell but 35 per cent. and the price of salt pork only 27 per cent.

Perhaps it is not worth while to pursue this subject further; it is sufficiently evident from these examples that railroad rates *have* "been reduced to keep pace with falling prices," and a good deal more, as many a poor fellow has learned in the last three years. Did Mr. Bryan ever stop to think that there were fewer men employed on the railroads of the United States in 1894 than in 1893 by 10 per cent.? Did he ever stop to think that those who remained worked shorter hours and for less wages? Did he ever stop to think of the suffering among hundreds of thousands of poor people, because the railroads were compelled to reduce wages and discharge men? And does he now stop to think of the share which he and those who are trying to elect him have had in producing this distress? Or does he care? Perhaps he really believes that a great, sensible people can be forever deluded by smooth phrases.

July Accidents.

Our record of train accidents in July, given in this number, includes 35 collisions, 65 derailments and 3 other accidents, a total of 103 accidents, in which 102 persons were killed and 187 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident, as reported, make it of special interest.

These accidents are classified as follows:

Collisions:	Rear.	Butting.	Crossing and other.	Total.
Trains breaking in two	8	0	0	8
Misplaced switch	2	2	1	5
Failure to give or observe signal	1	1	2	4
Mistake in giving or understanding orders	0	4	0	4
Miscellaneous	0	1	2	3
Unexplained	3	5	3	11
Total	14	13	8	35

Derailments.			
Broken rail	1	Careless running	1
Defective bridge	2	Bad loading	1
Defective frog		Bad switching	1
Bad track	1	Failure to give or observe signal	1
Broken wheel	5	Switch thrown under train.	1
Broken tire	1	Animals on track	5
Broken axle	3	Washout	9
Broken truck	2	Accidental obstruction	3
Broken car	1	Unexplained	24
Boiler explosion	1		65
Misplaced switch	2		

Other Accidents.	
Boiler explosion	1
Broken side rod	1
Breakages of rolling stock	1
Total number of accidents	103

A general classification shows:

	Collisions.	Derailments.	Other accid's.	Total.	P. c.
Defects of road	0	4	0	4	4
Defects of equipment	8	13	3	24	23
Negligence in operating	15	7	0	23	22
Unforeseen obstructions	0	17	0	17	17
Unexplained	11	24	0	35	34
Total	34	68	3	103	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other accid's.	Total.
Passenger	13	18	2	33
Freight and other	45	47	1	93
Total	58	65	3	126

The casualties may be divided as follows:

Killed:	Collisions.	Derailments.	Other accid's.	Total.
Employees	7	15	1	23
Passengers	75	0	0	75
Others	0	4	0	4
Total	82	19	1	102
Injured:				
Employees	18	13	2	33
Passengers	103	44	0	147
Others	2	5	0	7
Total	123	62	2	187

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. Killed.	Pass. Injured.	Emp. Killed.	Emp. Injured.
Defects of road	0	15	3	2
Defects of equipment	0	3	5	7
Negligence in operating	75	104	7	18
Unforeseen obstructions and maliciousness	0	25	7	2
Unexplained	0	0	1	4
Total	75	147	23	33

Seventeen accidents caused the death of one or more persons each, and 22 caused injury but not death, leaving 64 (62 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with July of the previous five years shows:

	1896.	1895.	1894.	1893.	1892.	1891.
Collisions	25	33	61	89	83	73
Derailments	65	52	75	87	104	91
Other accidents	3	3	12	5	5	5
Total accidents	103	88	148	181	192	169
Employees killed	23	16	43	38	29	29
Others killed	79	9	21	22	16	68
Employees injured	33	48	95	79	77	91
Others injured	154	28	55	97	73	121
Passenger trains involved	33	27	60	55	82	67
Average per day:						
Accidents	3.32	2.84	4.77	5.84	6.19	5.45
Killed	3.29	0.81	2.06	1.87	1.45	2.97
Injured	6.03	2.45	4.56	5.68	4.84	6.84
Average per accident:						
Killed	0.99	0.28	0.43	0.32	0.23	0.54
Injured	1.82	0.86	1.01	0.97	0.78	1.25

Seventy-five passengers were killed in July, 70 of them in two accidents. These two, the deplorable collisions at Logan and Atlantic City, have already been described in the *Railroad Gazette*. There were four other notable passenger train accidents in July, one at Altenheim, Ill., killing five persons, one near White Haven, Pa., where the engine fell down a very high bank; a butting collision near Willow Grove, Pa., where one of the conductors was asleep, and a derailment on a high trestle near Murphysborough, Ill., injuring 15 persons, but killing none outright.

Near Crawfordsville, Ind., a bridge which was endangered by a flood was tested by loading it with a locomotive carrying five men, instead of with a platform car loaded with pig iron, and three of the men were killed.

Several men were killed in July by railroad accidents which do not come within our record; two on a runaway train on a logging railroad near Carrigan, N. H., one in a similar accident in Braxton County, W. Va., and one by the overturning of a locomotive, due to defective track on the Spanish Fort railroad, which appears to be a light passenger railroad in the city of New Orleans.

We have seen accounts of 16 street car accidents in July. In only one of them was any person killed, and four caused no personal injury of any kind, although they were disastrous to the cars, and were of sufficient importance to lead the local papers to make a great deal of them. In the whole list the number of persons killed was one, and of injured 36. The most peculiar case was the derailment of an electric car at Alexandersville, O., which dislodged a new iron bridge and caused it to fall, although the floor held together sufficiently to prevent serious injury to the occupants of the car. There was one rear, one butting and one crossing collision; one derailment by the breakage of a wheel, one due to broken coupling, three runaways, one of which was a cable car; two other derailments due to high speed, one at a washout and one unexplained. An electric car ran against an oil wagon and a fire followed; one electric car ran into a locomotive and one locomotive ran into an electric car. These accidents were scattered all over the country: Baltimore, Brooklyn, Chicago, Detroit, Garretson, N. Y., Kansas City, Philadelphia, Richmond, St. Louis, Wilkes-Barre and Wyandotte, Mich.

Annual Reports.

Chicago & Northwestern.—The report for 1895 is a very favorable one. Gross earnings increased $5,380,387 or more than 19.14 per cent., and were larger than ever before in the company's history. Naturally there was a large increase in operating expenses, but not so great relatively, and the company ended the year with net earnings above operating expenses and taxes of $12,039,790, 20 per cent. more than in 1894. This also is an unexcelled record, and is greater by more than a million dollars than the results in 1892, which previously has been the company's best year. After paying the usual six per cent. on the preferred stock and five per cent. on the common stock, there was a very handsome surplus, $1,851,025. The common stock dividend was increased during the year, the company having only paid 4 per cent. in 1894, and 3 per cent. in 1893, when the rate was reduced from 6 per cent, at which it had long been maintained.

The surplus remaining after dividends is larger than for 10 years or since 1887, when it was reported as $2,612,271.

For the first time in several years we are able to make a fair comparison with the previous year's results, the reports of 1896 and 1895 including the operations of the Milwaukee, Lake Shore & Western for 12 months in both years. In 1894 the earnings of that road were included for nine months only, which vitiated any comparisons of results since 1893, as the earnings of that road are not reported separately. The summary of results shows the following comparisons for the two years:

	1896.	1897.	Inc. or dec.
Gross earn	$33,488,761	$28,108,374	I. $5,380,387
Op. exp. and taxes	21,448,971	18,511,728	I. 2,937,243
Net earn	$12,039,789	$9,596,645	I. $2,443,144
Interest	$7,122,365	$7,071,135	I. $51,220
Less credits	413,729	407,367	I. 6,362
Net int. charges	6,708,626	6,663,767	I 44,859
Balance	$5,331,163	$2,932,878	I. $2,398,255
Sinking fund	220,990	325,830	D. 104,840
Surplus	$5,110,173	$2,607,048	I. $2,503,125
Income from investments	257,909	244,907	I. 13,002
Balance	$5,368,082	$2,851,955	I. $2,516,127
Dividends	3,517,057	3,125,546	I. 391,511
Surplus	$1,851,024	(Def.) $273,590	I. $2,124,614
Def. Western lines	128,798	332,195	D. $203,397
Land sales	312,949	316,770	D. 3,820

The capital stock was increased during the year by the issue of $15,000 of common and $15,000 of preferred stock for conversion of $30,000 Peninsular Railroad of Michigan first mortgage bonds and is now $63,756,321. The funded debt was decreased $136,000, and the total funded debt May 31, 1896, was $131,528,500.

During the year over 10½ million dollars, representing credit to income account, and balances with the proprietary companies and other miscellaneous accounts extending over a series of years, were written off and the total amount credited to "cost of property." This reduced that item, as shown on the condensed balance sheets, by $10,511,641, so that the account is now $170,283,850. The company had a precedent for this action, about 10 million dollars having been similarly written off some years ago.

Freight earnings were $24,354,621 and increased 25 per cent. over last year, and passenger earnings were $7,408,827, having increased $364,000, or 5.17 per cent., amounting to over 22 per cent. of the gross revenue. The revenue from freight was the largest the company has ever received, but passenger earnings were greater in 1892 and the two following years, amounting to over nine millions in 1894. Rates on both classes were lower, the average rate per ton per mile falling from 1.14 cents to 1.03 cents, and the average rate per passenger per mile being 2.05 cents against 2.07 cents in 1895. On the passenger movement reported this small decrease represented a loss of $75,000. The passenger rate was lower than ever before received except in 1893 when the World's Fair traffic reduced the average to 1.95 cents per passenger mile.

The ton-mile rate last year was an unusually good one for this road, so that the decrease of 9.65 per cent. reported this year does not carry the rate as low as the company has received in other years, the yearly average rate between 1888 and 1893 having been less than the 1.03 cents reported this year.

The average gross earnings per mile of road were $6,656, against $5,587 in the preceding year, an increase of $1,069 per mile. Operating expenses and taxes per mile were $4,263, against $3,679 in the previous year, an increase of $583, or 15 $\frac{86}{100}$ per cent., and net earnings per mile were $2,393, against $1,907 in the preceding year, an increase of $485, or 25 $\frac{46}{100}$ per cent.

A comparative summary of operating expenses for two years shows as follows:

	1896.	1895.	Inc.
Maintenance of way	$4,017,433	$3,278,721	$738,711
Maintenance of equipment	4,104,939	2,414,470	1,690,499
Conducting transportation	11,593,665	11,165,138	428,527
General expenses	657,335	645,588	11,747
Totals	$20,373,402	$17,503,917	$2,869,485

The traffic movement was a very heavy one, as will be seen by the following table:

	1896.	1895.	Inc.	P. c.
Tons carried	17,082,389	13,822,906	3,259,483	23.5
Tons carried 1 mile	2,372,365,483	1,713,655,944	658,709,539	38.4
Passengers carried	15,241,910	15,117,298	124,612	.8
Passengers carried 1 mile	361,600,670	340,377,973	21,222,697	6.2
Engine mileage	34,307,596	30,866,139	3,441,457	11.1
Freight train mileage	16,809,353	14,662,063	2,147,290	14.6
Pass. train mileage	9,703,643	9,459,187	244,456	2.5

The cost per engine mile was 18.28 cents, 1.55 cents more than in 1895, fuel and oil costing more per mile run, as well as wages paid. The cost of coal was $1.55 a ton, 30 cents a ton less than in 1895.

No changes in equipment have been made for several years, but durning 1896 considerable expenditures have been made on this account. Freight cars of large capacity, equipped with safety appliances, were provided, the replacements of this equipment consisting of 1,125 box cars, 250 stock cars and 460 iron ore cars, costing $854,586. Twenty-four passenger and 10 switching engines were purchased to replace 34 engines worn out and destroyed, and 553 engines wer partially rebuilt in the company's shops. The net expenditure on engine account was $1,393,643, of which $319,788 was for replacements. Renewals, repairs and replacements of freight cars cost $2,185,781. The total charges for equipment were $3,579,424.

The only construction work in which the company is engaged is the building of the Wisconsin Northern road, of which about 60 miles will be built this year. About $69,000 was spent on this account in the last fiscal year by the Chicago & Northwestern. The company will be reimbursed by the sale of first mortgage four per cent. bonds of the Wisconsin Northern. The new road will give a market to the timber on the land grant in Wisconsin. The unsold lands of this grant amount to 284,000 acres, which at present cannot be realized on and give the company no traffic.

Last year's corn crop was the greatest that the railroads have ever had to carry, and that small fraction of it which is exported is still moving to the seaboard, and the latest statement issued by the Bureau of Statistics at Washington showing the distribution of this traffic to the various ports is thus of particularly interest. The total exports for the first seven months of the year were 57,114,908 bushels, valued at $20,296,967. This was an increase of over 33,426,000 bushels over the exports of the same period of 1895. The figures of exports via the various ports show how successful the Southern and Gulf roads have been in securing a very considerable proportion of this traffic, and how the Southern export ports have grown at the expense of New York as the predominant port of export. Of the increased exports of 33½ million bushels, New York secured but 3¼ million bushels more than in the previous year. The city's total exports of corn for the month were 9,775,000 bushels. Both Baltimore and New Orleans exported a larger amount than New York. New Orleans advanced to the first rank as a corn-exporting port, the total amount of corn shipped from that city during the period named being over 14 million bushels. The increase over last year was over 11 million bushels, evidence of the rapid growth of the city as a corn-exporting port. But the other Southern ports also show large increases; Baltimore, for instance, gaining eight million bushels. Newport News and Galveston together increased 8½ millions. During July, however, corn followed the Northern routes of traffic, and for that month, New York held first place as an exporting port; though the figures, 1,238,508 bushels, show a decrease of over 726,750 bushels. But despite the hot weather, the Southern ports show large increases. Baltimore shipped 1,071,812 bushels. Even the shipments via New Orleans had not wholly ceased. Corn will not move to that city in any material amount during the very hot months, yet the exports for July, which were only 31,704 bushels a year ago, had increased to 265,120 bushels this year. But the carrying of this great crop has not brought wealth to the railroads. The movement to the Southern ports was the result of exceedingly low rates and the margin of profit to the carrying line is very close to the cost of transportation. The movement of wheat for the seven months has not been so disadvantageous to New York which has been able to hold its own, and keep in first place. July shipments increased over one million bushels, though in the seven months there was a decrease of 316,908 bushels. The wheat exports from New York since Jan. 1 were 10½ million bushels; from Boston, 4½ millions; from Baltimore, 2¼ millions; from Philadelphia, 1½ millions: and from New Orleans a little less Galveston and Newport News exported a little less than 2½ millions, and the Pacific Coast 12 millions, a decrease of 5¾ million bushels.

The opening of the Chicago, Hammond & Western, 14 miles, from Hammond, Ind., to Blue Island (Chicago) has precipitated into the rate situation another problem and one which is likely to prove as troublesome to solve as that of the Three I's and Elgin, Joliet & Eastern, neither of which have ever been satisfactorily disposed of. It is stated that the first day's business of the new line was 90 cars of dressed beef and packing-house product. Just how much of this came from the Hammond industries for that day is not stated. The new line, which is built primarily to furnish another outlet to Chicago for the Hammond packers, is projected as another belt line around the city. There may be need of another belt line, but we had not heretofore supposed that there was any portion of the country adjacent to Chicago not already satisfactorily served with existing roads However this may be, it is reported that the first move of the new company is to demand of the Eastern lines a proportion of the through rate equivalent to that of the E., J. & E., notwithstanding the latter has a mileage more than ten times as great, with established connections at both ends. As is well known, the proportion allowed the E., J. & E. has been a bone of contention between the Eastern and Western roads for the past three years and is not settled yet. Consequently the managers are extremely loth to enlarge the trouble by granting the demands of the new line claiming that all it is entitled to is a switching charge commensurate with the work which it does in delivery to other roads. Unless there are reasons for allowing a proportion of the through rate which are not apparent to an outsider, the

position taken by the other lines is a judicious one and it is to be hoped that they will stand pat.

The brief summary of financial operations of the new Atchison Company, which was made public this week, shows that the company has been much more than able to meet the fixed charges of the half-year and should be gratifying to the new management. It has been generally supposed that with the unfavorable traffic conditions which have prevailed the surplus for the six months would be very materially less. The gross earnings were about the same in 1896 and 1895, the increase being only 1 per cent. But in operating expenses a saving of nearly one million dollars was made. The ratio of expenses to earnings, 82.9 per cent. in 1895, was 72 per cent. in 1896. It was this heavy reduction in expenses that enabled the company to show its proportionate expenses for the year earned, with about $477,000 to the good. The operating expenses were over $10,156,000, but taxes and rentals added $826,000 to this total. As the present fixed charges for six months are $2,325,000 for the six months it is evident that if operating expenses had remained at the figure they were in 1895 the company would have failed to meet these charges by about the same amount which it can now credit to surplus. But the reduction in expenses has been a legitimate one, for heavy improvements were made by the Receivers in 1895 and included in expenses. The expenditures chargeable to maintenance of way and structures and maintenance of equipment were especially heavy. The property is now in good condition and the new company will be charged with no unusual renewal expenses.

The immortal question, "Does the cross-head of an engine stop at the end of the stroke?" is up again for discussion, having made its periodic appearance this time in our contemporary *Power*, and we may perhaps be permitted to take a modest part in the debate, which will help to pass a summer half-hour. There are those who still believe that the cross-head does *not* stop at the end of the stroke. Their idea seems to be that if it stops it must stop for a measurable instant of time, and as it does not remain at a standstill even for an instant, as we shall show later, they conclude that it does not stop. An analogy may help to a clearer conception. If we throw up a stone vertically into the air it will not start to return until it has ceased to rise. That is self-evident. Now, at the instant it ceases to rise it begins to descend; there is no increment of time between the time it stopped and the time it started again. The force that governs the speed of the cross-head is transmitted to the crank-pin by means of the connecting rod and the speed of the cross-head is governed by the motion of the crank-pin. The crank-pin is in motion all of the time when the engine is running. As the crank-pin approaches the line of centers, the cross-head moves in one direction and immediately after it travels in the opposite direction; the instant the pin crosses the line of centers, the cross-head stops, but it takes no time for the pin to cross the line, since it crosses at a point on that line, and a point has no dimensions. From all this we conclude: First, the cross-head stops at the end of each stroke, second, it does not stop for even the smallest imaginable portion of time. Of course this refers to an ideal mechanism and not to the cross-head on the actual engine, because imperfection of the latter may permit it to stop for an exceedingly short time at the end of each stroke.

The Illinois Central has just published a preliminary statement for the fiscal year to June 30 which shows gross earnings from traffic of 21 million dollars. These are the largest in the company's history. The increase over 1895 is nearly two million dollars, or 9.27 per cent. The operating expenses increased nearly a million dollars, but the net earnings were still the largest the company has reported and show an increase of $915,512, or 13.06 per cent. over 1895. The operating expenses are low, 68 per cent. this year and 69.57 in 1895. The Illinois Central has been expanding in so many directions that its reports of earnings are of special interest at the present time. The financial position of the company is strong and the contingent liabilities it has assumed are apparently well within the company's present earning ability. The new additions to the company's mileage have been made on what appears to be favorable terms. The company has carried a very large proportion of the corn movement to the Gulf, which has been a marked feature of traffic affairs of the past year. Much of this traffic was carried at rates which could give little profit to the company, and its detailed report and traffic statistics will be waited for with interest.

NEW PUBLICATIONS.

Inventions and Their Commercial Development. By John Samson, C. E., London. Simpkin, Marshall, Hamilton, Kent & Co., 1896. One shilling.

This little volume has a reason for existence. It is written by a man who is a practical inventor, and a successful promoter of companies. Undoubtedly the most generally useful part of the work is that which is devoted to the exaggerated value put on inventions by their authors, and to the wiles of promoters in using patents as a basis for floating stock on a credulous public and robbing the unsuspecting inventor of his rights. His criticism of the too common method of organizing big companies on patented properties which, by their nature, offer no legitimate ground for large capitalization, is sound and wholesome. The suggested remedy through the organization of large patent-promoting corporations whose business shall be to sell or exploit inventions placed in their hands, might bear good fruit if honestly conducted.

TRADE CATALOGUES.

Electric Locomotives. Baldwin Locomotive Works (Burnham, Williams & Co.), Philadelphia, and the Westinghouse Electric and Manufacturing Co., Pittsburgh. By David Leonard Barnes, Consulting Engineer.

The Baldwin-Westinghouse Companies have proceeded very systematically in their enterprise of preparing to furnish the world with electric locomotives. The first step after the combination was made was to get up standard designs. This work was put under the direct personal supervision of Mr. Barnes, whom they retained as Consulting Engineer. The obvious place to begin was with the truck, for after all it makes little difference what the body of the so-called locomotive is if its trucks are robust and convenient. Accordingly, a standard truck was designed for use under electric locomotives. This has already been illustrated in considerable detail in the *Railroad Gazette*. Along with the development of the truck proceeded the design of the standard motor. Then the body of the locomotive, or motor car, or whatever one may choose to call it, was designed.

The catalogue shows all of these. The ordinary type of locomotive for express or freight service looks externally not unlike a passenger car with headlights, pilots, a whistle and gong. The purpose is to use the body of the locomotive for any load that may be convenient. The switching locomotive is little different externally, except that the superstructure or cab is short and in the middle of the floor, allowing a considerable open space at either end. Another design puts the cab on one end and a crane driven by an electric motor on the other. This makes a convenient wrecking car; and will also be useful in handling heavy freight in a yard. Still another type is a motor car, or locomotive if one chooses, for elevated and suburban service. This has a long body and its appearance is familiar to many people from its use on the Chicago elevated railroads Mining locomotives and rack locomotives have also been designed and electric mining locomotives have been built.

The catalogue shows those trucks, motors and locomotives which we have mentioned, and besides gives much important information. It opens with a chapter on the "Connections Between Armature Shafts and Driving Axles." Another chapter shows and discusses "Characteristic Curves of Motors." Five diagrams are given for each size of motor. These show electrical horse power, brake horse power, torque, efficiency and speed for different currents in amperes flowing into the motors and with line pressures of 500, 250 and 125 volts. They show also the relation between speed and pressure for various currents and the relation between torque and speed for different pressures. A longer chapter is entitled "Why do Electric Motors Revolve"? This we reprint practically in full. These chapters are followed by "Some Simple Problems in Electric Locomotive Service." Eleven different problems are stated and the methods of solution by the use of the diagrams given are explained.

The controller is described and illustrated, also the brake apparatus, and there is a short chapter with several excellent diagrams on "Draw Bar Pull." Finally there is a glossary of terms frequently used in electric railroad work. This occupies 16 pages, and we should say will be very useful and convenient.

The Browne & Sharpe Manufacturing Co., Providence, R. I., issued a couple of months ago a pamphlet entitled "Views Within Our Works." It was prepared as a souvenir for those who visit the shops. It is a beautiful piece of work, with clear type and excellent halftones, printed on paper of a soft gray color. The chief rooms and offices of the works are shown in full-page engravings, 6½ in. × 8 in. in size. With each engraving is a short description of the room or the machinery shown.

The same firm issues a pamphlet describing the latest additions to its machine shops, showing the methods of constructing these additions and the method of distributing power.

Foundry Supplies.—A new general catalogue has been issued by the Whiting Foundry Equipment Company, of Chicago. This catalogue covers the complete line of foundry appliances and supplies manufactured, and also shows their new air compressors, compressed-air hoists and a number of designs of bridge and jib cranes, some worked by electricity, some by compressed air and some by hand. The catalogue contains many handsome engravings of the various tools built.

TECHNICAL.

Manufacturing and Business.

The annual "shop vacation" of the Brown & Sharpe Manufacturing Co. was ended on Saturday last, Aug. 15, and the firm is again prepared to turn out orders for special work. During the vacation the office was open and machine tools and small tools listed in the catalogue and kept in stock were promptly shipped.

The stockholders of the Pittsburgh Bridge Company will hold a special meeting at the company's office, on Sept. 1, to vote on a proposed issue of $100,000 of the company's preferred stock.

Messrs. John S., Frederick W. and Charles D. Cooke have bought out the Leslie Brothers Manufacturing Co., of Paterson, N. J., and the Cooke Locomotive & Manufacturing Co. will hereafter build the rotary snow plows and other railroad appliances controlled by the Leslie Co. The rotary snow plows have been built at the Cooke locomotive shops.

Iron and Steel.

The Pennsylvania Steel Company is building new automatic rail loaders, designed to carry 60-ft. rails, at its rail mills in Steelton, Pa.

Edith furnace, of the Oliver Iron and Steel Company, was blown out last week, to remain out of blast until there is a better demand for iron products.

The Clifton Iron Company is changing one of its furnaces from charcoal to coke. Its other furnace will not be altered for the present, as the company has not yet decided to give up entirely the manufacture of charcoal iron.

At the annual meeting of the Lackawanna Iron and Steel Company, directors were elected as follows: Edward F. Hatfield, President; Samuel Sloan, Wm. E. Dodge, Harry A. C. Taylor, Moses T. Pine, Stephen S. Palmer, Walter Scranton, De Witt C. Blair and James Blair.

The plans for the open-hearth steel plant at Sharon, Pa., have been changed to make it one-half larger than was originally proposed. Work has been already begun on the main building, which is to be 915 ft. × 320 ft. The plant will consist of six 30-ton basic open-hearth furnaces, a blooming mill and finishing mill, with the necessary soaking pits and gas producers. The output will be from 350 to 400 tons per day. The Lloyd-Booth Co., of Youngstown, O., has the contract for the engineering, and details will soon be completed so that equipment contracts may be let.

The Penn Steel Casting Co. has cast a 16-ft. four bladed propellor wheel for Roach's shipyard, Philadelphia. The weight of the casting is 17,000 lbs.

A charter has been granted to the Virginia Iron Investment Co., Basic City, Va., which has been incorporated with a capital stock of $50,000. The officers of the company are as follows: President, J. W. White; Secretary, Spencer P. Hazard; Treasurer, Robert J. Ringwalt.

New Stations and Shops.

S. B. Markley & Co., who have the contract for the new office building of the Norfolk & Western at Roanoke, Va., have commenced work on the foundations. This building will be a handsome brick and stone structure, costing about $100,000.

The Baltimore & Ohio is to erect a large tobacco warehouse at the foot of Fell street, Baltimore, on Henderson's Wharf. The contract for the building was let last week to J. J. Walsh & Sons. The warehouse will be of brick 250 ft. × 300 ft., six stories in height with over 360,000 sq. ft. of floor space and a storage room for 25,000 hogsheads. It will be the largest warehouse of its type in Baltimore. The walls will be over 2½ ft. thick, the interior divided into four apartments each separated by fire walls and each having a steam elevator. There will be all modern appliances for inspection, handling and storage. The building will cost about $200,000. The architects are Baldwin & Pennington, of Baltimore.

The machine and locomotive repair shops of the Fitchburg road, at Mechanicsville, N. Y., have been permanently closed. Hereafter all repair work will be done at the shops at Keene, N. H.

Electric Headlights.

As the result of a recent trial of the National electric headlight on the Houston & Texas Central, officials of the road have decided to use this headlight. The Galveston, La Porte & Houston has purchased four of these electric headlights, two for their new engines built at the Baldwin Locomotive Works and two for old engines, replacing the oil lights. The new Chicago, Rock Island & Pacific fast passenger locomotive, No. 1,101, illustrated in the *Railroad Gazette*, July 10, 1895, has been equipped with the National electric headlight.

More Rails for Japan.

A second order for American steel rails for Japanese railroads was placed recently with the Carnegie Company by Kenzo Iwahara, the New York representative of Mitsul & Co., of Japan. It is a special order for 9,000 tons, to be delivered by the end of the year, and is for extensions of three roads, one in Middle Japan, one from Osaka to Maizuru, and one in Kiushiu Island, the southernmost of the Japanese Archipelago. The contract calls for 60-lb. rails. The price has not been made known. Other orders from Japanese railroad companies for rails will probably follow.

A New Ocean Record.

The American Line steamship St. Paul arrived in New York on Aug. 14, having made the passage from Southampton in 6 days and 31 minutes, nearly two hours better than the record established by the St. Louis, the week before, and five hours better than her own previous record. The trip was made on the shorter course, the total number of knots covered being 3,046. The daily runs were 493, 524, 517, 525, 531 and 456 knots, and the average speed was 21.08 knots per hour. The weather throughout the trip was fair, except for the usual fog off the banks. As this was the St. Paul's thirteenth voyage

across the Atlantic, superstitious people are at a loss to account for her remarkably good performance.

Decline in Pig Iron Production.

The report of pig iron production in the United States for July, published in the *Iron Age*, shows a still further decrease in production. The following table, prepared from the figures given shows the number of furnaces in blast at the beginning of each month this year and the corresponding months of 1895, together with the capacity per week, in gross tons:

	1896.		1895.	
	Furnaces in blast.	Cap. per week. Gross tons.	Furnaces in blast.	Cap. per week. Gross tons.
Aug. 1	176	153.678	200	180,525
July 1	191	180,532	185	171,194
June 1	194	182,220	172	157,224
May 1	196	189,396	171	156 554
April 1	200	187.451	171	158,132
Mar. 1	207	189,583	173	156,979
Feb. 1	215	198 599	178	163,391
Jan. 1	241	207,481	182	168,414

As this table shows, there was a large falling off of the number of furnaces in blast during July, the decrease in capacity being over 20,000 tons per week. On Aug. 1, the rate of output was down to the line of that of the spring of last year. An extract from another table is given, showing the condition of the coke and anthracite furnaces on Aug 1.

Location of Furnaces.	Total No. of stacks.	Number in blast.	Capacity per week.	No. out of blast.	Capacity per week.
Pennsylvania	174	69	72,840	105	65,455
Ohio	46	17	11.232	29	17,013
The South	86	36	29,067	50	28,554

The total number of anthracite and coke furnaces in blast at the present time is 153, producing 153,504 tons of pig iron per week. Of the total 113 charcoal furnaces in the country, only 23 are now in blast, representing a capacity of 6,264 tons per week.

What is Tectorium?

The August number of the consular reports issued by the State Department at Washington contains a paper on Use of Tectorium in Europe. The consuls in Europe, who have contributed the information in regard to it, state that it consists of a galvanized iron web covered with a gelatinous substance and is translucent, but not transparent, and that it is sold in but small quantities in a few places. It is described by a manufacturer as a substance that can be bent without being broken, is both tough and flexible, is not softened by the rays of the sun, is non-soluble, is not affected by severe cold, is a bad conductor of heat, is well adapted for roofs on account of its extreme lightness; when exposed to the sun it loses its original yellowish color in time and becomes harder and more durable; can be cut by shears, nailed to wood and transported without danger; can be easily repaired in case it is cut and does not break.

Electric Roads in New Jersey.

The New York & Philadelphia Traction Company was incorporated July 13, 1894, with a capital stock of 10 million dollars, the Central Jersey Traction Co. and other companies being merged with the new corporation. Active preparations have been made since that time for building a network of roads connecting the principal towns and cities throughout New Jersey. It is stated that the contract for $475,000 has now been given for the work upon the road between New Brunswick, Bound Brook, Raritan and Dunellen. A power-house to cost $100,000 will soon be erected at Bound Brook. Joseph Canby, of Philadelphia; Frank A. Magowan and J. Henry Darrah, of Trenton, are at the head of the enterprise.

A New Coal-Washing Plant.

In a recent number of the *Engineering and Mining Journal*, a description is given of the Robinson coal-washing plant recently installed by the Tennessee Coal, Iron & Railroad Co., at their No. 2 slope, near Birmingham, Ala. The run-of-mine coal is brought in pit cars from the slope into the tipple house, where it is screened, and the slack, amounting to some 400 tons per day, discharged into a hopper from which it is taken by conveying machinery to the washer. This washer consists of a cone, built of heavy plate steel, having at its lower end a specially arranged water jacket. The agitator inside consists of a shaft provided with wrought-iron blades, and which makes about eight revolutions per minute. The lower end of the cone is fitted with valves operated by means of levers. The tank is overhead, and the water is fed in at the bottom through the jacket before mentioned, thus flowing upward through the cone, and out at the top. The valves regulate the force of the flow, so that the pressure is made to correspond to the character of the coal to washed. The overflow water is collected and pumped back into the tank. The coal is fed in at the top of the cone, and in passing down it meets the upward flow of water, which forces the good clean coal upward again and out with the overflow, while all pyrites, slate and bone coal, on account of their greater specific gravity, pass down through the cone and out at the bottom. The good coal passes with the overflow over inclined perforated chutes into the cars below. When very finely divided coal is to be treated, a supplementary settling tank is used to avoid loss by passing off in the overflow.

The Englewood & Chicago Electric Railroad.

The progress of work on the 54 miles of electric road now being built between Chicago and Englewood and referred to in our issue of June 12, is being watched with interest. The storage batteries which are to supply the power are of the same type as were used on Madison avenue, New York, a few years ago, but were discarded. There are now under contract, 3 Heine boilers of 200 H. P. each; 2 Willans engines of 250 H. P. each and 4 Walker generators. To enable the plant to be operated at the most efficient point, a Worthington cooling tower and condensing system is to be used, and a Green economizer for heating the feed water. The engines, which are triple expansion, are to be run condensing. This plant has been designed to get the greatest possible economy obtainable, and the company claim that they will be able to show as low a cost of production of power as any plant in the world, where the cost of fuel is the same. Twenty open cars have been contracted for, and for the winter use 20 closed cars will be furnished. The above cars will be provided with the Walker electric motor. A very complete system of battery transfer has been arranged for, whereby a large number of cars may be handled most quickly and conveniently. The batteries are to be placed on the trucks from beneath the floor of the car, and all handling of the batteries will be below the rails in a pit or cellar, so that no portion of the space above the ground will be occupied by the battery or its transfer apparatus. The batteries to be used are of the traction type, and are manufactured by the Electric Storage Battery Company, of Philadelphia. Seventy-two cells will be used on each car, which the company claim will operate it from 50 to 60 miles on one charge. Two sets of batteries will be provided for each car, one set being charged while the second operates the car, and the operation of replacing the discharged battery with a charged battery will not occupy more than a minute of time.

The buildings, which are now being constructed, will be of the latest and most approved design, and will be a departure from the well-known street railroad barn architecture.

Iron Ore Production in Germany.

The report of the United States Consul at Annaberg, Germany, on the condition of the iron ore industry of that country, states that the total output of iron ore in the German Customs Union in 1894 amounted to 12,392,065 tons, of which 8,433,784 tons were mined in Germany, and the remainder in Luxembourg. A portion of this ore was exported, but as about an equal amount was imported, the total given above represents very nearly the amount consumed by the German smelters. The imported ores come from Spain, Sweden, Algeria, Elba and Greece, besides swamp ore from Belgium and Holland. Native ore is mined in large quantities in a few places only. The production of Upper Silesia is decreasing, and is now not expected to last more than another generation. The Saxon mines are practically exhausted, and those of Wurtemburg are quite unimportant. At Amberg, Bavaria, 40.000 tons of brown ore was the yield in 1894, and at Maximilianschutte, in the Upper Palatinate, the output is 120,000 tons. The smelting works at the latter place possess further extensive beds in Thuringia, where some 60,000 tons are obtained each year.

Large Rail Orders.

The Lackawanna Iron & Steel Company has the contract from the New York, New Haven & Hartford road for 23,000 tons of rails. A rail order for 20,000 tons has been given to the Cambria Iron Co. by the Pittsburgh Traction Co.

LOCOMOTIVE BUILDING.

Two new class L passenger engines have been turned out at the Juniata shops of the Pennsylvania, for use on the Middle and New York divisions. A new freight L machine, with 68-in. drivers, has also been placed in the Middle Division service.

The Pittsburgh Locomotive & Car Works have just delivered to the Seabord Air Line, 12 ten wheel locomotives, having cylinders 19 in. × 24 in. They have also shipped to the Olta Railway, Japan, two six-wheel, connected, side-tank locomotives, with cylinders 13 in. × 20 in.

BRIDGE BUILDING.

Aberdeen, S. Dak.—It is stated that the Gillette, Herzog Manufacturing Company, of Minneapolis, Minn. has received the contract for the construction of three bridges over the James River, at this place.

Allegheny, Pa.—The California avenue bridge has been reopened to travel after having been elevated several feet. The work of raising the bridge was let to the Pittsburgh Bridge Company, and the bridge was closed to public travel on July 6. The contract of the bridge company called for a raise of 18½ ft. at one end and 14½ ft. at the other, and the new structure is built on top of the old. As the bridge now stands the floor is 98 ft. above the curb line of McClure avenue, which runs under it. The contract price was $19,700, which added to the cost of grading, raising houses, etc., makes a total cost of about $45,000.

Atlantic Highlands, N. J.—A new highway bridge at this place was opened for travel on Aug. 15. Following are particulars of the structure: Span on the skew, 50 ft.; at right angles, 40 ft.; width, 25 ft.; width of roadway, 20 ft.; depth of abutments, 9 ft.; the arch is 8 in. thick at the crown; skew, 53 deg.; rise, 11 ft. The bridge is to carry Grand avenue over Mount avenue. The arch is 19½ ft. from the level of Mount avenue. The borough gave $800 and the balance of the cost of the bridge was subscribed by a few of the citizens of the borough, headed by Mr. George F. Lawrie. Contractors, Nimrod, Woodward & Son, Atlantic Highland N. J. Engineers, Melan Arch Construction Co., New York. The bridge is built on the Melan system with rustic stone face. Alsen's cement was used throughout the structure.

A new rustic stone arch bridge over Grand avenue, at its intersection with Mount avenue, was thrown open to the public on Aug. 15. The arch is from the Melan Arch Construction Company, and is of solid concrete steel-ribbed, with solid masonry abutments. The roadway over the bridge is 94 ft. long and 25 ft. wide. The bridge is 20 ft. high in the arch; the span is 50 ft.

Boston, Mass.—Objection has been made to the proposed 50-ft. bridge over the Boston, Revere Reach & Lynn Railroad, on the ground that it would be too narrow to accommodate the traffic of Shirley, Centennial and Garfield avenues. The recommendation has come from Revere that the bridge be built at least 75 ft. wide.

Butler, Pa.—The court has approved the report of receivers recommending a new bridge over Connoquenessing Creek, at Marshall Fording in Farwood Township.

Bradford, Pa.—The resolution for changing the Mechanic street bridge to Barbour street and erecting a new bridge on Mechanic street has been referred back to the commiteee with instructions to confer with the County Commissioners.

Capitol View, Md.—The contract for the building of a 72-ft. bridge over the Baltimore & Ohio Railroad tracks has been secured by the Charleston Building Company, of Charleston, W. Va.

Cincinnati, O.—Bids are wanted, Aug. 31, for the superstructure of a bridge over the Cincinnati, Lebanon & Northern road, at Cincinnati. Bids are to be addressed to A. P. Butterfield, Clerk of Board of Administration.

Cleveland, O.—The Board of Control has passed a resolution calling upon the Nickel Plate Railroad Company to commence work at once on the bridge over the Wilson avenue crossing.

Conneautville, Pa.—The bridge over Foster Creek a Mulberry street has been condemned and the passage way closed The borough will replace the bridge with a substantial new one.

Des Moines, Ia.—It is reported that the contract for the superstructure of the Fifth street bridge has been awarded to John A. Killman for $19,100, and that for the abutments to J. B. Locke for $16,214.64.

Elkton, Md.—The question of a new bridge over the Elk River, leading to Chesapeake City, is being discussed. The present structure is not considered safe, and while a new bridge is about to be built, a petition has been sent in to the Board of County Commissioners asking that it be made a drawbridge. This would greatly benefit the town, as boats could then go up nearly into town, and the wharf property along the river front would increase in value.

Englewood, N. J.—The committee of the Board of Freeholders having charge of the two new bridges in this township met on Aug. 4 and awarded both contracts to Mr. Joseph W. Stagg, the bridge at Collignon's Mills for $3,300 and the Old Hook bridge for $1,249.

Gettysburg, Pa.—Proposals will be opened by the Commissioners, Sept. 2, for the erection of a new bridge across Bermudian Creek, in Huntingdon Township. The span is to be 90 ft. Bids for either a wooden, iron or steel superstructure are invited.

Greensburgh, Pa.—The bridges between this place and New Stanton, which were washed away by the floods, are being replaced. New piers are being erected at the County Home, at Sullenberger's and at Youngwood.

Lancaster, Pa.—Bids are wanted Sept. 5 for building a 60-ft. iron bridge across Conowingo Creek, in Fulton Township.

Middletown, Conn.—The new highway bridge over the Connecticut River to Portland is now swung by electricity, the electrical equipment consisting of four G. E. 800 motors. The bridge is 450 ft. long.

Newtown, O.—C. H. Glandorf has been awarded the contract for building the new bridge over the Miami River at his bid of $16,776.66.

New York, N. Y.—Colonel Andrew D. Baird, President of the East River Bridge Commission, has announced that the borings on the Brooklyn side of the river have been completed, and that the results obtained have been very satisfactory. Borings on the New York York side are nearly completed, and it is hoped that work can be begun in a few weeks on the foundations for the New York tower. It is the intention of the Commissioners to call an architect in consultation as to the best method of beautifying the bridge, without taking away any of its useful features.

Niagara Falls, N. Y.—The contract for the structural material for the new bridge to take the place of the old railroad suspension bridge over the Niagara River, has been awarded to the Pennsylvania Steel Co., Steelton, Pa. The new bridge will have a span of 550 ft. between the piers, which will be of masonry. The bridge is designed for a load on the railroad floor of two consolidation engines, with 40,000 lbs. on each pair of drivers, followed by a train of 3,500 lbs. per lineal ft. At the same time the driveway floor is to support a live load of 3,000 lbs. per ft.

The iron bridge being placed across the hydraulic canal between Second and Main streets for the use of the New York Central road is the most ponderous structure of its kind that was ever erected in this region. It is very massive, containing over 700 tons of iron and 10 tons of bolts.

Osceola, Mo.—Contracts for building the Blair line's steel railway bridge over the Osage have been awarded. McNerney Bros., of Carthage, Mo., secured the masonry, and the Wisconsin Bridge Company, of Milwaukee, the superstructure, including grading. The total cost will exceed $50,000.

Philadelphia, Pa.—The plans of the proposed bridge to be built by the Fairmount Park Transportation Company, across the Schuylkill River in the park, were submitted to Theodore Cooper, Consulting Engineer, on Aug. 6. Mr. Cooper recommended certain changes, among others being the placing of metal work of more massive character on the piers. Plans will probably be drawn up in accordance with the changes as suggested.

Port Jervis, N. Y.—The Port Jervis & Monticello road is placing an iron bridge across the canal here. The old wooden bridge has been considered unsafe for some time.

Pottsville, Pa.—The following bridge contracts were closed on Aug. 10 by the Commissioners and Controller: Klingerstown, to the Horsehead Bridge Co., New York, at $2,695; Auburn, to the Pottsville Bridge Co., at $1,724; Maybel, Barry Township, to the Pottsville Bridge Co., at $712.

Reading, Pa.—It is now learned that the Bern bridge cannot be built for $12,000, as was at first supposed, but will cost at least $14,000. The Commissioners are in doubt as to their right to exceed $12,000. The court will be consulted in the matter, and until they have definite information the contract will not be given out.

Rockwood, Ont.—The contract for an iron bridge over the river at this place has been let to the Montreal Bridge Company. It is to be completed by Sept. 1.

Silver City, Idaho.—Bids have been opened by the Board of County Commissioners of Owyhee County, Idaho, at the office of the Clerk of said board, for the building of approaches to Bruneau bridge, as follows: 1,376 cu. yds. of fill—gravel and brush; 2,407 cu. yds. of earth fills; 1 18-ft. span bridge, to correspond with bridge already constructed.

Westerly, N. J.—It is said that the stone work about the new High street bridge will be finished in a few days. The grading on both sides is progressing rapidly. In two months, nearly 1,700 yds. of masonry have been built.

Woonsocket, R. I.—A petition signed by a number of taxpayers, asking that Wood avenue be extended to the Diamond Hill road and that a wooden bridge be built across the Peters River, has been acted upon favorably by the Common Council, and a resolution for the Aldermen to pass this in concurrence has been offered.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Canadian Pacific, 1 per cent. on the common stock, and 2 per cent. on the preferred stock, both payable Oct. 1.
Chicago, Burlington & Quincy, quarterly, 1 per cent. payable Sept. 15.
Delaware & Bound Brook, quarterly, 2 per cent. guaranteed, payable Aug. 20.
Fort Wayne & Jackson, 2¼ per cent, on preferred stock, payable Sept. 1.
Illinois Central, 2½ per cent. payable Sept. 1.
Mexican Northern, quarterly, 1 per cent. payable Sept. 2.
Northern Pennsylvania, quarterly, 2 per cent. payable Aug. 25.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Alabama Great Southern, annual, company's office, Birmingham, Ala., Oct. 7.
Central Vermont, annual, St. Albans, Vt., Sept. 9
Chicago Great Western, annual, Chicago, Sept 3.
Gray's Point Terminal Railway Co., special, St. Louis, Mo., Aug. 21.
Elgin, Joliet & Eastern, annual, Chicago, Sept. 15.
Iowa Central, annual, Chicago, Sept. 4.
Louisville, New Albany & Chicago, annual, New York, Sept. 9.
Minneapolis & St. Louis, annual, company's office Minneapolis, Minn., Oct. 6.
Nashville, Chattanooga & St. Louis, annual, Nashville, Tenn., Sept. 9.
New York, Susquehanna & Western, annual, Taylor's Hotel, Jersey City, N. J., Sept. 3.
Toledo & Ohio Central, annual, company's office, Toledo, O., Sept. 6.
Wabash, annual, company's office, St. Louis, Mo., Sept. 8.
West Virginia & Pittsburgh, annual, Weston, W. Va., Sept. 1.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Association for the Advancement of Science* will hold its forty-fifth annual meeting at Buffalo, N. Y., Aug. 22-29.

The *New England Roadmasters' Association* will hold its annual meeting at Revere House, Boston on Aug. 19 and 20. For programme see issue of July 31, p. 544.

The *Society for the Promotion of Engineering Education* will hold its annual meeting at Buffalo, N. Y., Aug 20-22. For programme see issue of Aug. 14, page 578.

The *American Street Railway Association* will hold its annual convention at St. Louis on Oct. 24 and 25.

The *Roadmasters' Association of America* will hold its next annual meeting at the Cataract Hotel, Niagara Falls, N. Y., beginning Sept. 8.

The *Traveling Engineers' Association* will hold its next annual meeting at Minneapolis, Minn., commencing Sept. 8.

The *American Institute of Mining Engineers* will hold its annual meeting in Denver, Col., beginning on Sept. 21. For provisional programme see issue of July 24, page 530.

The *American Society of Railroad Superintendents* will hold its next annual convention at Niagara Falls, N. Y., beginning Sept. 9.

The *American Association of General Passenger Ticket Agents* will hold its next annual convention at Atlantic City, N. J., beginning Sept. 15.

The *Travelling Passenger Agents' Association* will hold its next annual convention at St. Louis, Mo, beginning Sept. 29.

The *American Railway Association* will hold its next annual convention at New York City, beginning Oct. 7.

The *Freight Claim Association* will hold its next annual convention at The Jefferson, Richmond, Va., beginning Oct. 7.

The *Association of Railway Superintendents of Bridges and Buildings* will hold its annual meeting at Chicago on Oct. 20. For programme see issue of Aug. 7, page 560.

The *Master Car & Locomotive Painters' Association* will hold its annual meeting at the Park Avenue Hotel, New York City, beginning Sept. 9. For programme see issue of Aug. 7, page 560.

American Association of General Passenger and Ticket Agents.

The forty-first semi-annual meeting of this association will be held at Atlantic City, N. J., on Sept. 15, 1896. The association will convene at 11 o'clock a. m. on the above date at the Casino.

There are several important questions to be disposed of, and it is believed that they will necessitate a three days' session at least. First among these will be a further report from the committee appointed at the Quebec meeting September, 1894, to consider the question of controlling the issue of inter-line tickets.

At the last meeting the chair was instructed to appoint a committee of five to recommend changes in the constitution and by-laws. This committee consists of Messrs. Martin, Daniels, Ford, Turk and Stone.

The committee appointed to report some plan for a uniform practice in cancelling inter-line tickets, consisting of Messrs. Buchanan, Danley and Kendall, are expected to make a final report.

The committee appointed to recommend a uniform method of action upon application for ticket representation will have their report ready. The committee are Messrs. DeHaven, Lee and Fellows.

The question of uniform contracts on inter-line tickets was referred to Messrs. Stone, Armstrong and Carrel. It is presumed that this committee will be able to report progress.

In response to the circular issued by the Secretary on July 18, 1896, the following topics for discussion have been received:

(1) Have a term for each inter-line ticket. (2) Some plan to better control inter-line ticket representation. (3) Combination class tickets. (4) Standard contracts on tickets. (5) Lost tickets. (6) Recent ruling of the Post Office Department with reference to the carriage of mail on passenger trains. (7) Closer relations.

Western Society of Engineers.

A regular meeting was held in the Society's rooms, Monadnoch Block, Chicago, Aug. 5.

Mr. Ossian Guthrie read the paper of the evening—"Relics Turned up in the Chicago Drainage Canal" Prof. Chas. H. Ford, who has devoted considerable time to investigation and study of the geologic features of the canal, was present with a number of photographic views, of a variety of peculiar formations found there, with which he supplemented his entertaining talk on the subject.

The resignation of Mr. Henry Goldmark, as Secretary, was received and accepted, and Mr. Nelson L. Litten was elected to the office by the Directors.

The Secretary was instructed to incorporate with the next published proceedings the calendar of papers to be read before the Society, as arranged by the Committee on Professional Papers, which is as follows:

Aug. 19, "Notes on Coal" C. F. White.
Sept. 2, "Street Pavements in Chicago," C. D. Hill. Discussion, R. E. Brownell.
Sept. 16, "Parks and Roads," H. C. Alexander and J. F. Foster.
Oct. 7, "Railway Yards and Terminals," H. G. Hetzler.
Oct. 21, "Steel for Boilers and Fireboxes," T. L. Condron.
Oct. 21, "Steel Forgings," H. F. J. Porter.
Nov. 4. "Medical Treatment of Men on Engineering Work," Dr. S. W. Maphis.
Nov. 18, "Cableways," Frank B. Knight.
Dec. 2, "The Equipment of Manufacturing Estab ishments with Electric Motors and Electric Power Distribution," D. C. Jackson.
Dec. 2, "Electric Traction," Edward Barrington.
Dec. 16, "Modern Pumping Machinery," E. E. Johnson.

The Entertainment Committee arranged an excursion down the Drainage Canal for Saturday, Aug. 15, the train leaving Polk street station at 8:30 a. m.

American Association for the Advancement of Science.

The preliminary programme of Section D, Mechanical Science in Engineering, for the Buffalo meeting, has been issued. The section will meet for organization on Monday, and in the afternoon the Vice-President, Prof. Frank O. Marvin, of Lawrence, Kan., will deliver an address on the "Artistic Element in Engineering." The titles of papers to be read at this section, so far as now arranged, are as follows:

Steam Engineering.—(1.) The Most Economical Points of Cut-off for Steam, by Henry T. Eddy. (2.) The Performance of Small Steam Pumps, by M. E. Cooley. (3.) The Friction of the Water in the Pipes of a Hot-Water Heating System, by I. H. Kinealy. (4.) On a Continuous Indicator for Engine Tests, by Thomas Gray. (5.) New Water Pony Brake for Testing Steam Turbines without Reduction Gearing, by J. E. Denton. (6.) Apparatus for Tracing a Curve Representing the Force Required to Overcome the Inertia of Reciprocating Parts of a Steam Engine, by D. S. Jacobus. (7.) An Apparatus for Accurately Measuring Pressures of 2,000 lbs. per Square Inch and Over, by D.S.Jacobus. (8.) Apparatus for Absorbing the Destruction of Moisture in a Steam Main, by D. S. Jacobus. (9.) Values of Heat of Combustion of Various Gases per Cubic Foot for Use in Calculating the Heating Power from the Analysis of a Gas, by D. S. Jacobus.

Mechanics and Materials.—(10.) Some Results of the United States Timber Tests, by J. B. Johnson. (11.) On the Molecular Stability of Metals, by Wm. A. Rogers. (12.) A New Testing Machine for Beams and Framed Structures (capacity 50 tons), by Malverd A. Howe. (13.) On the Yield Point of Steel, by Thomas Gray.

Hydraulic Engineering.—(14.) On the Conversion of an Ordinary Planer into an Apparatus for Precise Graduations. by Wm. A. Rogers. (15.) Irrigating of the Eastern United States, by Olin H. Landreth. (16.) The Hydrographic Survey, by F. H. Newell. (17.) Some Notes, Physical and Commercial, upon the Delta of the Mississippi River, by Elmer L. Corthell. (18.) Seepage from Colorado Canals, by L. G. Carpenter.

Miscellaneous.—(19.) An Arrangement Using Storage Batteries for the Automatic Regulation of Engine Loads in Power Plants of Variable Output, by W. S. Franklin. (20.) The Cycle of the Plunger-Jig, by R. H. Richards. (21.) Soaring Flight, by O. Chanute. (22.) National Endowment of Engineering Research, by W. S. Aldrich. (23.) The Better Distribution of Forecasts, by John A. Miller.

Master Car Builders' Association.

We have received from the Secretary of the Master Car Builders' Association the following list of subjects and committees for the convention of June, 1897:

Standing Committees.

On Arbitration.—G. W. Rhodes, Chairman; John Mackenzie, M. M. Martin, G. L. Potter, J. N. Barr.

On Supervision of the Standards and Recommended Practice of the Association.—R. H. Soule, Chairman: G. L. Potter, A. M. Waitt.

On Triple Valve Tests.—G. W. Rhodes, Chairman; A. W. Gibbs, W. S. Morris.

On Standard Wheel and Track Gages.—To confer with the American Railway Association: J. N. Barr, Chairman; G. W. Rhodes, R. E. Marshall.

On Brakeshoe Tests.—S. P. Bush, Chairman; D. L. Barns, J. W. Cloud.

Subjects and Committees for 1897.

1. *Automatic Couplers (continued).*—To advise what changes may be desirable in the standard size of M. C. B. automatic coupler shank, and to recommend a standard yoke or pocket strap for rear attachment to car: C. M. Mendenhall, A. E. Mitchell, J. T. Chamberlain, W. H. Thomas, Wm. Garstang, T. G. Duncan, J. Macbeth.

2. *Uncoupling Arrangements for M. C. B. Automatic Couplers (continued).*—To consider whether a standard uncoupling device is practicable and the details thereof, and to recommend a device which would be applicable to the greatest number of couplers possible: G. L. Potter, C. E. Turner, R. C. Blackall, R. M. Galbraith, G. W. West, G. B. Sollers.

3. *Loading Logs, Poles, Bark and Long Structural Material on Cars.*—To suggest modifications of or additions to recommended practice, if found desirable: P. Leeds, W. H. Day, P. H. Peck, S. P. Bush, F. H. Stark, J. R. Petrie, W. H. Lewis, B. Haskell, C. Coller.

4. *Trains Parting.*—To consider the extent and causes of break-in-twos with automatic couplers, and to suggest remedies: A. M. Waitt, W. Lavery, F. H. Soule, D. Hawskworth, B. E. Thompson.

5. *Passenger Car Pedestal and Journal Box for Journal, 4¼ × 8 in.*—To suggest designs: G. W. West, T. B. Purves, Jr., E. A. Benson, F. W. Chaffee, J. W Marden.

6. *Specifications and Guarantee for Cast-Iron Wheels.*—To propose a revision of the recommended practice of the association, and to consider therewith the form of wheel: J. N. Barr, J. H. McConnell, S. P. Bush, J. Hodge, W. McWood.

7. *Air Brake and Signal Instructions.*—To confer with a committee from the American Railway Master Mechanics' Association and to propose a revision of the code adopted in 1892: E. W. Grieves, E. D. Bronner, S. Higgins, H. McCarthy.

8. *Freight Car Buffers.*—To follow up and report upon experiments about to be made with improved buffers: Wm. Forsyth, A. E. Mitchell, F. W. Brazier, Thos. Fildes, J. Player.

9. *Box-Car Side and End Doors.*—To submit designs for side and end doors, including fixtures, for adoption: J. J. Henderson, G. N. Dow, C. A. Schroyer, Robt. Gunn, F. B. Griffith.

10. *Arch Bars and Column Bolts for Diamond Trucks.*—To recommend forms in detail, for cars of 60,000 lbs. capacity, and to submit designs for same for cars of 80,000 lbs. capacity: E. D. Nelson, T. Lyon, G. Gibbs, J. H. Rankin, J. Simmons.

11. *Independent Committee of Five to present individual report on Design for Steel Car Frames:* J. N. Barr, C. M. Mendenhall, R. P. C. Sanderson, S. A. Charpiot, G. R. Joughins.

12. *Subjects for 1898:* J. T. Chamberlain, A. M. Waitt C. A. Schroyer.

PERSONAL.

—Mr. J. B. Flanders, formerly Superintendent of the Cincinnati, Jackson & Mackinaw road, has been made General Superintendent, with headquarters at Toledo, O.

—Mr. A. C. Shand, Assistant Engineer for the Pennsylvania at Altoona, Pa., has resigned. Mr. Shand and D. F. O'Rourke, a contractor, have entered into partnership with William E. Howley, of Pittsburgh, as contractors.

—Mr. William Pratt, recently Division Engineer of the Baltimore & Ohio on its line between Washington and Philadelphia, has been appointed to the professorship of Mechanical and Electrical Engineering, at Delaware College.

—Mr. A. S. J. Holt, General Agent in Cincinnati of the Grand Rapids & Indiana, has succeeded H. Wilson Browne as General Agent of the Star-Union Line. Mr. Browne has been General Agent of the Star-Union for more than 32 years.

—Mr H. A. Wilson, District Passenger Agent of the Columbus, Hocking Valley & Toledo, with headquarters at Toledo, has resigned, and A. J. Richter, formerly City Passenger Agent of the Pennsylvania lines at Cincinnati, has been appointed his successor.

—Mr. William Whyte, for several years Superintendent of the Texas Trunk road, was appointed Receiver of the property on August 13. The apppointment will take effect September 1. Mr. Whyte will succeed George T. Atkins, who was placed in charge of the road three years ago.

—Mr. F. C. Gay, formerly General Freight Agent of the Southern California road, has been appointed General Freight Agent of the Atchison, Topeka & Santa Fe at Topeka. Mr. Gay formerly held the same position with the Atchison, but was transferred to the Southern California in January, 1895. Since that date the office of General Freight Agent on the Atchison has been vacant.

—Mr. W. H. Hill, who has been Chief Clerk to Vice-President Finley, of the Great Northern, has been appointed Assistant General Freight Agent of the road, succeeding W. J. Evans, now General Agent at St. Louis. Mr Hill is a nephew of President Hill of the Great Northern. H. L. Schute, who has had the title of General Traffic Manager, is hereafter to have the title of Traffic Manager.

—Mr. Frederick Harrison, General Manager of the London & North Western, and Mr. Robert Turnbull, Superintendent of the Line, are to arrive in New York by the Lucania this week. The present programme is that they shall stay in New York now only two days and then go to the Pacific Coast, stopping at many places of interest on the way. They will probably return to New York, by the way of Canada, in October.

—Mr. Walter N. Hoag has been appointed Car Accountant of the West Shore road, succeeding Mr. W. W. Wheatly, who resigned to become Superintendent of the Brooklyn Heights Street Railroad. Mr. Hoag has been with the West Shore since it was under construction as Train Dispatcher of the Hudson Division. He is now about 38 years old and has been in railroad service since 1876. Before going to the West Shore he was on the New York Division of the Pennsylvania, and he had previously been in the service of the New York & New England. Before that he was on the Newburg, Dutchess & Columbia as Station Agent and in other positions.

—The funeral of Mr. A. C. Hippey, late General Superintendent of the Norfolk & Western, who died in Roanoke, Va., on Aug. 10, was held at his residence in that city on Wednesday of last week, the interment being in the city cemetery. A very large number of people at-

tended the services, and the officers and employees of the Norfolk & Western present represented every branch of its service, officers, clerks, trainmen and shopmen. There was a guard of honor from the Grand Army Post of Roanoke. Some account of Mr. Hippey's railroad career was published in this column last week, but it seems well to speak of his life in greater detail. He was born in Columbia, Pa , Sept. 25, 1846, and attended the public schools of the town. Soon after the outbreak of the civil war he entered the army, though but 16 years of age, and served three years in Pennsylvania regiments. At its close he secured a position with the Philadelphia & Reading as chainman in an engineering party, and continued in its construction department for three years in this and similar positions. In 1868 he went to the Pennsylvania in its maintenance of way department and remained there for six years. He then went to the Baltimore & Ohio, but re-entered the service of the Pennsylvania within two years as Supervisor at Baltimore. In 1881 he became Assistant Engineer of the Northern Central and Baltimore & Potomac roads at Baltimore, and a year later was transferred to the Philadelphia, Wilmington & Baltimore. That position he also held one year, when he was promoted to be Engineer of Maintenance of Way of the Philadelphia & Erie and Northern Central at Williamsport, Pa. In January, 1890, he was appointed Superintendent of the Altoona Division of the Pennsylvania, but three months later resigned to go to the Norfolk & Western as Assistant General Manager. In 1891 his title was changed to General Superintendent. Mr. Hippey had been in declining health for nearly three years and his death was not unexpected. He was a man of very high character, and besides being a successful railroad officer was one of the most prominent and influential citizens of the town in which he lived. The same estimable qualities of character which gave him a high position as a citizen and as an officer secured for him the good will of his men. He had a bright and quick mind and a long and varied railroad experience, which had given him an intimate knowledge of several branches of railroad service. He had attained early in life to very responsible positions, and until his health began to give way he seemed destined to go very much higher.

ELECTIONS AND APPOINTMENTS.

Chattanooga Southern.—Mr. J. T. Slatter has been appointed General Freight and Passenger Agent and Auditor, vice Mr. H. P. Eagar, resigned.

Fort Worth Stock Yards Belt Line.—The stockholders have elected the following officers and directors: President, G. W. Simpson, Boston; First Vice-President, L. V. Niles, Boston; Second Vice-President, W. E. Skinner, Fort Worth; Treasurer, A. G. Crosby, Boston; Secretary, N. P. R. Hatch, Chicago; Directors, G. W. Simpson, L. V. Niles, W. E. Skinner, A. A. Green, C. H. Silliman, C. W. Simpson and Page Harris.

Great Northern.—F. E. Ward, formerly Secretary to President Hill, has been made Assistant to the President. The title of C. H. Cannon, Superintendent of Car Service, has been changed to Car Accountant.

Hoosac Tunnel.—A. G. Marshall has been appointed Contracting Agent, with headquarters in Cincinnati. George C. Semple has been appointed Contracting Agent, with headquarters at Louisville. F. E. Brown, who has been agent for the line at St. Louis, has been transferred to Kansas City.

Marietta & North Georgia.—The title of Mr. Joseph McWilliams is Superintendent and not General Manager, as stated last week, the latter title being abolished under the present management. He is in direct charge of the operating department.

Norfolk & Western.—General Manager Sands has issued an order abolishing the office of General Superintendent, held by the late A. C. Hippey, and merging the duties of the position with his own office. The offices of Division Superintendent of Motive Power and Division Engineer of Maintenance of Way, held, respectively, by R. P. C. Sanderson and J. B. Fuller, are also abolished. The officers holding these positions are assigned, respectively, as assistants in the offices of the Superintendent of Motive Power and Engineer of Maintenance of Way.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Bangor & Aroostook.—A. E. Trites, the contractor, has finished ballasting the Ashland branch, and this part of the road is now up to standard of the main line. Mr. Trites has also completed the two miles of new track from Ashland to the mill which is being built by Bangor capitalists.

Butler & Pittsburgh.—Work is now in progress over the whole length of the road from Braddock to Butler, Pa., and, it is hoped, will be finished before the end of the year. The contract has been sub-let in part to 10 contractors, and there are now over 2,500 men at work on the line. A change has been made in the original survey, which provided for two tunnels, one 500 ft. long, and the other a little longer. It is now been found practicable to do away with the longer tunnel, which was to be located near what is known as the summit cut, and make a deep cut through the hill instead.

Carolina, Tennessee & Ohio.—Five miles of grading has already been finished on this road, which is being built from Wilmington to Southport, N. C., a distance of 30 miles. About 200 men are now employed on the work and it is expected that the road will be finished to Southport by Dec. 1. Frank H. Blodgett is the contractor. The control of the company is held in Philadelphia and Mr. J. E. Challenger, of that city, is President.

Great Northern.—President Hill has purchased 2,000 ft. of water front property on Rice's Point, Duluth, upon which will be built a large elevator and probably a passenger dock for the use of the Northern Steamship Company. It has been stated that the road has acquired the controlling interest in the Duluth Superior Bridge Company, now building a bridge connecting Superior and Duluth, which will be used instead of the Northern Pacific bridge.

Greenville & Hudson.—The Street and Water Commissioners of Jersey City, have passed an ordinance granting the Lehigh Valley Railroad Company, of which the above road is a branch, a right of way which will enable it to establish an independent connection with its terminal yards at Communipaw, Jersey City. The company has been endeavoring to obtain the concession for more than a year. The ordinance permits the company to cross Communipaw avenue at grade with four tracks. A grade crossing is claimed to be a necessity at the point in question. By crossing Communipaw avenue at grade connection will be made with the tracks in the company's Pacific avenue yards, and then continue to the shore point, passing along by Cove ground, now owned by Jersey City, by running along the northerly towpath of the Morris Canal.

Illinois Central.—Work is pushed rapidly on the second tracking on the main line. A second track has just been laid from Bridge Junction (near Cairo) to Villa Ridge, Ill. Then there is a stretch of single track to Dongola, from which point a second track has been laid to Carbondale. Many long sidings and switches are being put in which can be connected easily and give the company a large additional mileage of second track.

Jamestown & Lake Erie.—Grading for the extension from Jamestown to Falconer will be completed about Sept. 1. When finished the extension will furnish an entrance into Jamestown for the Dunkirk, Allegheny Valley & Pittsburgh and a connection at Mayville with the Western New York & Pennsylvania.

Lake Superior & Ishpeming.—This road was completed to Negaunee, Mich., last week, and the first regular trains to that point were run to Marquette on Aug. 12. The distance between these points is about 10 miles. The road will soon be completed to Ishpeming, and the total length of the line will be about 20 miles. It reaches the important mines in the northern peninsula of Michigan, and several of the mining companies operating in this district are the chief owners of the new road. W. G. Mather, of Cleveland, O., is President, and John Egan is Assistant President, in direct charge of the work, with office at Marquette, Mich.

Lehigh Valley.—The company proposes to extend the terminus of the line in Elmira, N. Y., from East Fifth to East Second street in order to reach its property at East Second and State streets. The engineers on the proposed new line between Horseheads, near Elmira and Odessa, have completed their work, and it is said work will be commenced in a few weeks.

Little Kanawha.—Gilmer County, West Virginia, on Aug. 8 voted to subscribe $50,000 to the building of this road. The road is to be built from Parkersburg, W. Va., up the valley of the Little Kanawha River, to Glenville, Gilmer County, about 90 miles. The contract has been given, and it is expected that work on the first section, from Parkersburg to Palestine, 29 miles, will be begun this summer. The road is expected to open up and develop the coal and timber lands at the Kanawha headwaters.

Miller River.—The contracts for building this road were let on Aug. 7 by the County Commissioners of the road, at Seattle, Wash. J. A. Bailey was given the contract for the road itself, and L. C. Mattall for three small bridges, contracts to be completed within 75 days. The new line will be six miles long, and will connect Seattle with a rich mining region now being developed.

New Roads.—Contractor Collins will begin work before Sept. 1 on the new line for the Clover Creek Limestone Company to connect with the Pennsylvania at the bridge opposite the mouth of Clover Creek, Pa. It will be a short line reaching the company's quarries.

Pittsburgh & Potomac.—This company has been recently incorporated in Garrett County, Md. The line is to begin at a point on the north bank of the Potomac River, near the mouth of Glade Run, in Garrett County, and extend thence northerly to the Pennsylvania State line. The capital stock of the company is $500,000. The incorporators are George S. Rees, Andrew B. Shaw, Merritt Wilson, William C. Brown and Edward H. Sincell. It is said that the road is to be an extension of a proposed road from Strasburgh, Va., and will form a connection between that line and the Connellsville and Pittsburgh road. Preliminary surveys have been made, and it is said that active steps looking to the building of the road will be taken at once.

Queen Anne's.—Work is still progressing rapidly through the eastern peninsula of Maryland beyond Denton, Md. The bridge across the Tuckahoe River has been completed and grading has been finished to a point about one and a half miles west of Denton. The grading from Denton to Greenwood is also nearly finished. The road from Queenstown on Chesapeake Bay to Hillsborough has been finished some time. Regular train service from Hillsborough to Queenstown will begin shortly. Hillsborough will be the eastern terminus for a short time only, as the track will soon be completed to Denton, where Baltimore passengers will be able to take the train.

Rhinelander & St. Paul.—This company filed articles of incorporation in the office of the Secretary of State, at Madison, Wis., on August 14. The road is to be about 20 miles long, from Rhinelander, in Oneida County, to Camp Josie Station, on the Cazenovia branch of the Chicago, Milwaukee & St. Paul road, and will operate the road already built from Camp Josie Station to Cazenovia Junction, on the Chicago, Milwaukee & St. Paul road. The capital stock of the company is $200,000. The incorporators, who are also the directors, are Charles A. Goodyear, Fannie A. Goodyear and Sidney C. Eastman, Chicago, and Alva S. Goodyear and Adam Gabe, of Tomah, Wis.

San Antonio & Texas.—The new purchasers of the road are making preparations to extend the line from Lavernia, its present terminus, to Stockdale, Tex., and thence to Galveston. The court having charge of the receivership of the road has been petitioned by the new owners to authorize the issuance of Receiver's certificates covering the cost of building the proposed extension.

Sisson Lumber Co.—This company is building a new line chiefly for the purpose of its business between Upton and McCloud River, in one of the northern counties of California. About 200 men have been laying track for some time, and it is expected to complete the road, which will be 15 miles long, before fall. In order that no delay might occur in the track-laying the company has been increasing its construction forces and lately employed a number of Chinamen. Last week there were disturbances between the white and Chinese forces, and finally all of the latter were compelled to leave the town.

South Side.—This company has been chartered in Pennsylvania to build a road 3½ miles long, between Bridgewater and Soho, passing through Rochester and Monaco. Work will be begun as soon as the new bridge over the Ohio River is completed at Rochester.

Wilkes-Barre & Northern.—The work of surfacing the newly constructed roadbed north of Luzerne, Pa., is now being done between Luzerne and Trucksville. Ties are being put in rapidly, and the rails are expected to arrive in a few days, from the Johnson Co., Lorain, O. A large cut is being made at Trucksville through hardpan which it is necessary to blast. Grading has been completed as far north as Leonard's, one mile below Dallas.

Electric Railroad Construction.

Albany.—Mayor Thatcher has returned to the Common Council, without his approval, the resolution giving the Albany, Helderberg & Schoharie Electric Railway Co. the right to lay tracks through certain streets in the South End of Albany.

Allegheny, Pa.—Col. J. M. Schoonmaker is at the head of a movement to effect a co-operation between the Nunnery Hill Inclined Plane Co. and the Pleasant Valley Electric Railway Co. in the matter of a new trolley loop at Nunnery Hill. It is proposed to construct a branch trolley line from the Perrysville avenue road to the inclined plane, which is to be straightened and extended at a milder grade up Fairmount street at a cost of $30,000.

Companies capitalized in the aggregate to $87,500 were given charters on Aug. 11. Theophilus Sproul, of Allegheny City, is President of the companies. The Directors of each are: Jay R. Jenkins, O. C. Burgorf, Allegheny City; Oscar R. Cratty, Grafton; M. J. McCann, Pittsburgh. The names and the amount of capital stock of each company follows: Evergreen-Hamlet; $12,000; Howard Street, $6,000; Herr Island, $9,000; Juniatta Street, $12,000; Marion Avenue, $6,000; Madison avenue, $7,000; Peaceful Valley, $15,000; South Avenue, $6,000; Benton Avenue, $9,000; Bouquet Street, $6,000. The aggregate length of the system will be 13¼ miles. The lines will be built entirely within the city of Allegheny and the motive power is to be either compressed air or electricity.

It is the intention of the Pittsburgh, Allegheny & Central Traction Co. to ask Councils for the right of way over an entirely new route which will compete with the Perrysville Avenue lines of the Pleasant Valley Traction Co.

Austin, Tex.—The Houston Electric Railway Co. has been incorporated with a capital stock of $2,000,000. The directors are Albert M. Partin and George E. Smith, of Boston; Austin Corbin, of New York; T. W. House, W. D. Cleveland and others, of Houston, Tex.

Berryville, Ark.—Preliminary arrangements are being made for an electric line, 12 miles in length, from Berryville to Eureka Springs, through the Ozark Mountains.

Brooklyn, N. Y.—The Newtown Creek Terminal Co. has been organized to build tracks for an electric road along the wharves in South Brooklyn. The new company will be granted a public hearing before the State Railroad Commissioners on Aug. 26 on its application for permission to build the road.

Brockton, Mass.—The Brockton, Bridgewater & Taunton Street Railway Co., has awarded the contract for building its road to M. A. Coolridge, of Fitchburg. It is stated that work will begin soon.

Buffalo.—The Mayor has refused to sign the franchise of the Crosstown Street Railway Co., to extend its lines in a number of the streets until it embodies certain provisions. About three weeks ago the Aldermen paseed a resolution granting the franchise.

Chester, W. Va.—The electric road, which is to be built between Chester, W. Va., and East Liverpool, O., is being promoted, by J. E. McDonald, of East Liverpool. It is proposed to cross the Ohio River on a steel bridge 2,000 ft. long.

Cleveland, O.—The Cleveland, Painesville & Eastern Railroad has been completed and cars will begin to run regularly in a short time. A full description of the road and its equipment will be found in another part of the *Railroad Gazette* this week.

Deering, Me.—The work of laying the new track on Forest avenue by the Portland Railroad Co. is progressing rapidly.

Denver, Col.—An ordinance was recently passed by the Aldermen of Denver granting a 20-year franchise to the Denver, Golden & Globeville Rapid Transit Co., which it is proposed to connect with the line of the City Cable Company at Fourteenth and Market streets and run to Globeville, has been vetoed by the Mayor. From Globeville the road is to run east on the north side of the river and connect again with the cable road on the West End line. It will be taken up again at the West End terminal and run to Golden. By the terms of the franchise the company must agree to pay 3 per cent. of its gross earnings the first 10 years and after that 5 per cent.

Hartwell, O.—The Hartwell Council has passed an ordinance granting the Cincinnati Incline Plane Railway Co. the right to extend its tracks from the Carthage Fair Grounds to Hartwell. Work will begin at once on the extension and the route may be finished by the middle of September.

Hudson, Mass.—A new electric railroad is to be constructed to connect Hudson, Bolton and Lancaster. A company has been formed with a capital of $100,000, and among those interested are Henry Tower and W. H. Moulton, of Hudson, and W. H. Felton, of Bolton.

Hull, Que.—Traffic has been opened on the Hull Electric Railway Co., between Hull and Aylmer, a distance of nine miles.

Irwin, Pa.—The extension of the Greensburg, Jeannette & Pittsburgh electric line, from Irwin to Pittsburgh, will follow the township road from Pittsburgh to Irwin. Work between Penn Station and Manor is being rapidly pushed, and it is the intention of the company to have the entire line completed before winter.

Lewistown, N. Y.—The entire track and overhead equipment of the Lewistown & Youngstown Frontier Railroad Co. betweeh Lewistown and Youngstown, a distance of 10 miles, has been finished, and a successful trial trip has been made. The motor cars, which were built by the J. G. Brill Co, of Philadelphia, are 22 ft. long, with eight seats arranged crosswise. The contract work has been done by Crayne & Teuch, of 139 Main street, Buffalo. The new road is an extension along the river bank of the George Road from Niagara Falls to Lewistown, which was built by the same comgany. Electric roads now connect Buffalo and Youngstown, a distance of over 40 miles.

Milwaukee, Wis.—Milwaukee, Racine & Kenosha Electric Railway Co. began the survey of its new line between Milwaukee and Racine on Aug. 12, and it is stated that it will be completed by the last of November. The road will be of modern construction throughout. Among those interested are A. W. Bishop, Matthew Slush and W. W. Hazzard, of Milwaukee.

Minneapolis, Minn.—The Twin City Rapid Transit Co. which now own and operate all the street railroads in both St. Paul and Minneapolis are making improve-

ments in its line in both cities by relaying the tracks with 90-lbs. T-rails, which are being welded together each to each at the ends.

Oneonta, N. Y.—The motive power of the Oneonta Street Railway Co., is being changed to electricty and the road extended by the new company which recently secured control of the road. The power will probably be furnished from the Pruyn Brothers' Milling and Power Co. It is expected to have the line in operation before winter.

Pittsburgh, Pa.—A charter has been issued to the Glenwood Railroad Co., capitalized at $20,000, to build an electric line from a point on the main line of the Pittsburgh & Connellsville Railroad where it crosses Second avenue in Pittsburgh to the main line of the road between Marion Station and Laughlin Junction, James B. Washington, of Pittsburgh, is President. Among the directors are A. W. Black, S. K. Harris and J. X. Smith, all of Pittsburgh.

On Aug. 11, the Northern Liberties Railway Co. of Pittsburgh, was granted a charter to build a line beginning at the foot of Sixteenth street. Pittsburgh, at the Pittsburgh Junction Railroad, and extending to the Allegheny Valley Railroad at Fifteenth and Pike streets a distance of one-half mile. The company is capitalized at $10,000. President, William L. Hirsch. Pittsburgh. Directors, William D. Crawford, John W. Carpenter and others.

St. Louis.—The City Passenger Railway Co. has applied for an ordinance to give the company the right to build electric lines in all parts of St Louis. The company has not as yet been incorporated. It is provided that all streets occupied by the company shall be graded by it, and that the company shall pay $1,000,000 during the 50 years of the franchise, in annual installments of $10,000 during each of the first 10 years, and $30,000 a year during the closing 10 years of the term.

Syracuse, N. Y.—On Aug. 10 the Lakeside Railroad Co. was granted the desired extension of time for the construction of its road. The time for commencing the work on the road is now fixed at Oct. 1, 1896, and the completion by July 1, 1897. The company secured its franchise the middle of May.

Thompsonville, Conn.—Charles H. Nichols, of New Haven, has completed the surveys for an electric road to be built at Thompsonville.

Wheeling, W. Va.—Work has been commenced at Triadelphia on the second division of the new Wheeling Suburban Electric Railroad, which is to connect Wheeling and the intermediate towns with West Alexander, Pa. The road from Elm Grove to Triadelphia has been in operation for more than a month. It is said that the road to West Alexander will finally connect at Washington, Pa., with a proposed road from Pittsburgh.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The following is a comparative statement of gross earnings, operating expenses and net earnings (exclusive of taxes and rentals), for six months of the fiscal year to June 30, 1896 and 1895:

	1896.	1895.	Inc. or dec.
Gross earn	$13,590,235	$13,452,777	I. $137,458
Oper. exp	10,156,386	11,153,636	D. 997,250
Net earn	$3,433,849	$2,299,141	I. $1,134,708

The earnings and expenses for the first six months of the present year, including income from investments and deducting taxes and rentals, the balance being applicable to the payment of interest, were:

Earn., including income from investments	$13,785,552
Exp., including taxes and rentals	10,982,681
Profit	$2,802,871
Present fixed charges for same six months	2,325,295
Surplus over fixed charges for the six months	$477,576

Brigantine Transit Co.—An application was made to Vice-Chancellor Reed, in Camden, N. J., on Aug. 17, by the bondholders of this company, for a postponement of the motion of Receiver Joline for the sale of the company's property on September 28, on the ground that the applicants desired time to perfect arrangements for the reorganization of the company. It was stated that under the new organizatien preferred stock would be issued to the secured creditors and common stock to the unsecured creditors. An agreement was made, satisfactory to the bondholders and the receiver, and the Vice-Chancellor decided to lay the matter over for a month.

Chicago & South Side Rapid Transit.—The foreclosure sale of the South Side Elevated Railroad of Chicago, otherwise known as the "Alley L," will take place Sept. 15.

Columbus Southern.—The foreclosure sale of this road will take place at Columbus, Ga., on Sept. 10. The sale will be made in pursuance of a decree of the Circuit Court of the Northern District of Georgia, in the suit of the Central Trust Co., of New York, to satisfy a mortgage of over a million dollars held by that company. No bid will be accepted for a sum less than $300,000. Capt. James W. English, of Atlanta, has been appointed special commissioner to conduct the sale.

Illinois Central.—The company reports earnings for the twelve months ended June 30, 1896 and 1895, as follows:

	1896.	1895.	Inc.
Miles operated	2,888	2,888	.....
Gross earn	$21,004,525	$19,056,994	$1,947,530
Oper. exp. and taxes	14,301,548	13,268,530	1,033,018
Net earn	$6,702,976	$5,788,464	$914,512

The gross receipts from traffic for the month of July, 1896 (including receipts from operation of St. Louis, Alton & Terre Haute R. R., 239 miles) are estimated at $1,615,829; the recipts for July, 1895 (miles operated, 2,888) were $1,508,656, the estimated increase being $107,173.

New England.—The results of the half year, as obtained from the quarterly reports to the Massachusetts Railroad Commissioners, make the following comparisons:

FROM JAN. 1, TO JUNE 30.

	1896.	1895.	Inc. or dec.
Gross earn	$2,656,485	$2,864,655	D. $208,170
Oper. exp	2,017,714	2,060,494	D. 42,780
Net earn	$638,771	$804,161	D. $165,390
Other income	11,198	2,850	I. 8,348
Total income	$649,969	$807,011	D. $157,042
Fixed charges	541,933	922,617	D. 380,684
Surplus	$108,036	Def. $115,606	I. $223,642

Manhattan.—The earnings for the quarter ended June 30 are reported as follows:

	1896.	1895.	Inc. or dec.
Gross earn	$2,321,813	$2,403,987	D. $82,174
Oper. exp	1,385,915	1,399,546	D. 13,631
Net earn	$935,898	$1,004,441	D. $68,543
Other income	42,500	89,021	D. 46,521
Total	$978,398	$1,093,462	D. $115,064
Fixed charges	616,799	713,663	D. 96,864
Balance	$361,599	$379,799	D. 18,200
Dividend	450,000	450,000	.....
Deficit	$88,401	$70,201	I. $18,200
Fiscal year ending June 30:			
Gross earn	$9,256,931	$9,393,570	D. $136,639
Oper. exp	5,530,958	5,413,964	I. 116,994
Net earn	$3,725,973	$3,979,606	D. $253,633
Other income	232,520	287,135	D. 54,615
Total	$3,958,493	$4,266,741	D. $308,248
Fixed charges	2,840,397	2,748,695	I. 91,702
Balance	$1,118,096	$1,518,046	D. $399,950
Dividends	1,800,000	1,800,000	.....
Deficit	$681,904	$281,954	I. $399,950

Cash on hand, $73,600, and a profit and loss surplus of $4,663,342.

National Tehuantepec.—An English syndicate, at the head of which is Sir Whetman Pearson, has just concluded a lease of thi sroad with the Mexican Government. The terms of the lease include an agreement on the part of the syndicate to finish works already well advanced for the improvement of the harbor of Coatzacoalcas at the Atlantic terminus of the road, and to construct the harbor works at Salina Cruz, the Pacific terminus, which were included in the original plans, but which the Mexican Government has been so far unable to execute. The road itself will be improved and put in first-class condition. A line of ships plying between Salina Cruz and San Francisco will soon be put on and deliver freight to the lines plying in the Gulf of Mexico.

Electric Railroad News.

Brooklyn, N. Y.—The Brooklyn Heights Railroad Company's report for the quarter ending June 30, 1896, to the New York Railroad Commission, shows gross earnings from operation for the three months of $1,160,790, an idcrease of $74,707 over the same quarter of 1895; operating expenses were $591,283, a decrease of $144,919; net earning were $569,507, an increase of $219,626. The income from other sources than operation was $66,009, an increase of $6,157. The fixed charges and taxes were $501,027, a decrease of $39,837. The surplus for the quarter is $134,490, against a deficit for the same quarter of 1895 of $131,130. The operating cost was 50.9 per cent. of the earnings excluding taxes, or 57 per cent. including taxes, as against 67.8 per cent. and 74.4 per cent. respectively for the same quarter of 1895. This quarterly report completes the statement for the fiscal year ending June 30, 1896, and the figures for this year compared with those for the fiscal year ending June 30, 1895, are as follows:

	1895.	1896.
Gross earnings	$4,052,189	$4,272,392
Operating expenses	2,859,806	2,503,226
Net earn	$1,192,383	$1,769,166
Income from other sources	220,875	232,600
Gross income	$1,413,258	$2,001,766
Fixed charges and taxes	2,075,865	2,044,875
Deficit	$662,607	43,10

The operating cost for the year was 58½ per cent. of the gross earnings, not including taxes, as against 70½ per cent. for the year ending June 30, 1895. The general balance sheet of June 30, 1896, shows a deficiency of $238,013.65, against $547,086.16 on June 30, 1895.

Chicago, Ill.—The stockholders of the South Chicago City Railway Co., the West Chicago Street Railroad Co. and the Chicago General Railway Co. have sanctioned the consolidation of the companies, the new corporation to be known as the Chicago General Railway Co.

Cincinnati, O.—On July 29 the Cincinnati Street Railway Co. absorbed the Mt. Adams & Eden Park Inclined Railroad and the Mt. Auburn Cable Railroad, and now controls and operates the various lines formerly owned by those companies. The capital stock at the same meeting was authorized to be increased from $11,000,000 to $18,000,000, which increase will be used from time to time as it is required. The elective officers of the Cincinnati Street Railway Co. are as follows: John Kilgour, President and General Manager; Jas. A. Collins, Secretary and Assistant General Manager; Robert A. Dunlap, Treasurer; John Harris, Superintendent.

Hammond, Ind.—On Aug. 11, the Hammond, Whiting & East Chicago Electric Railway Co. filed articles for an increase of capital stock from $100,000 to $300,000. Twelve miles of track are now operated by the company.

Joplin, Mo.—The Joplin & Galena Electric Railway Co. has filed a mortgage to secure 255 $500 bonds, to run 30 years at 6 per cent. and payable in gold.

Kansas City, Mo.—The Northeast Electric Street Car Line, with all the property belonging to the company, will be sold under foreclosure on Aug. 30.

Philadelphia, Pa.—On Monday of this week the Chester Avenue branch was discontinued, and a number of other changes were made in the running schedule on the lines of the Union Traction Co.

At a meeting of the Board of Directors of the Philadelphia Traction Co. on Aug. 17, President Widener stated that all the work on the new lines had been completed at a cost of $3,650,000, or $350,000 less than the amount allowed by the Union Traction Co. The $350,000 balance is a clear profit to the latter company.

Pittsburgh, Pa.—At the annual meeting of the shareholders of the Pittsburgh & Birmingham Traction Co. on Aug. 11, the proposition to lease the road and franchises of the company to the Second Avenue Traction syndicate was rejected. The annual report of President Harry Moore shows the earnings of the Pittsburgh & Birmingham Traction Co. for the fiscal year 1895, ending June 30, to be the highest in the history of the company. There were carried during the year 7,549,305 passengers, being an increase of 1,300,000 over the previous year and 700,000 over 1893. The gross earnings for the year were $412,288, and the net earnings $41,371 over all expenses, including the payment of delinquent state taxes amounting to $30,000.

A meeting of the stockholders of the Second Avenue Traction Co. will be held Aug. 22 to take action on the proposition to lease the property and franchises of the company to the United Traction Co. The item in our construction notes last week stating that action had already been taken was incorrect.

Syracuse, N. Y.—The Onandago Lake Electric Railway Co., which recently obtained a franchise referred to in our issue of July 24, has forfeited the same owing to its failure to comply with its provisions, which in effect were that the road should have been begun by July 1. The Common Council refused an application asking for an extension of time.

Toledo, O.—Papers were filed on Aug. 7, releasing the mortgages for $4,000,000 held against the Toledo Traction Co. by the Guarantee Trust Co. of New York.

TRAFFIC.

Traffic Notes.

Reports from the cotton crop in Texas territory are very discouraging. The damage from hot winds and dry weather is much more than was at first supposed and it is doubtful if the crop is as large as last year, notwithstanding the largely-increased acreage. The corn crop in that section is said to be a complete failure and it will be necessary to ship in corn from Kansas this year.

Judge Caldwell, in the United States Circuit Court at Denver, has made an order upon application of the Midland Terminal Railroad Company, whose line is the connecting link between the Colorado Midland Railroad and Cripple Creek, directing Receiver Ristine of the Colorado Midland to resume traffic relations with the Terminal at once, on the basis existing before the with drawal of the old through rate.

The Texas roads are finding that the large number of summer excursion rates which they have from time to time authorized are proving troublesome, as all the brokers are well supplied with portions of the round trip tickets and are able to cut regular one-way rates as much as 20 per cent., and there seems no way to stop it until the tickets expire. Strong efforts will be made to discontinue the practice of running "home-seekers" and other excursions whenever any of the roads feel disposed, and if it is not found practicable to entirely do away with these excursions they will be limited to months when this class of travel is benefited.

Chicago Traffic Matters.

CHICAGO, Aug. 19, 1896.

The Lake Michigan Car Ferry has evidently found that it cannot hold its own with the rail lines on the basis of differentials granted it under its agreement with the St. Paul all-rail lines, and, on Aug. 14, again gave notice of a reduction in rates. The basis as agreed at the last conference with the St. Paul all-rail lines was:

1	2	3	4	5	A	B	C	D	E
55	46	37	23	19	25	20	17	14	13

The figures named in the reduced tariff, from Chicago and South Chicago to St. Paul and Minneapolis, with corresponding reductions on commodities, were:

1	2	3	4	5	A	B	C	D	E
53	48	33	20	17	20	17	15	12½	11½

The Ferry has also announced a corresponding reduction from the agreed proportions to be accepted on business originating east of Chicago. The Chicago Great Western immediately gave notice of a reduction to meet the rates of the Ferry line, effective Aug. 21. The Ferry line has now given notice of a further reduction to a basis of 46 cents first class, and there is considerable apprehehension that this failure to maintain the rates agreed upon will result in a general demoralization of the Chicago-St. Paul rates.

About a month ago the Dululth-St. Paul lines reduced their carrying rate from Duluth to the twin cities to 75 cents a ton, the former rate having been $1. That rate, compared with the soft coal rate existing then from Chicago, meant the exclusion of Illinois coal from the Northwest, for the coal going from Duluth was Ohio coal brought to that port by lake. So the Burlington and Milwaukee & St. Paul reduced their rate to $1.50. Then a meeting was held and it was agreed that until Sept. 1 the rate from Duluth should be 75 cents and that from Chicago $1.50. After Sept. 1 the Duluth rate was to be $1 and the rate from Chicago $1.62½. Duluth-St. Paul roads were satisfied with that differential and signed a stipulation that no change could be made without 30 days' notice. Already three of the lines parties to it have announced reductions. The Burlington declares it will keep in the $1.50 rate and two of the northern lines have quoted a 75-cent rate.

Western roads have all voted against a number of plans which have been suggested for making low rates for Labor Day celebrations. Now if any excursion rates are made they can only be between points local to the same road.

There is a strong probability no Western road will make reduced rates for the conclave of Knights of Pythias at Cleveland in September. The Knights were originally to have held this year's encampment at Minneapolis, but determined not to because the Western roads would not make rates as low as they thought they should. Minneapolis was therefore abandoned and Cleveland selected. Western passenger men have to date voted solidly against several propositions to reduce fares to Cleveland for this occasion.

Lake shipments from Chicago continue to increase and all-rail shipments to decrease in spite of the reduction in grain rates put into effect by order of the Joint Traffic Association some 30 days ago. Last week's aggregate, in tons, carried by the lake lines was 143,536 tons, and the total by all-rail lines 51,014. Following is shown the number of tons carried by each of the competing roads for the last two weeks:

Roads.	Week to Aug. 13.		Week to Aug. 8.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central	5,887	11.5	7,207	14.7
Wabash	4,688	9.2	4,080	8.3
Michigan Sthrn	6,009	11.8	5,687	11.6
Pitts., Ft. Wayne & Chicago	7,180	14.8	5 831	11.9
Baltimore & Ohio	5.256	10.3	5,751	11.7
Pitts., Cin., Chi. & St. Louis.	5,412	10.6	4,667	9.5
Grand Trunk	4,267	8.4	4,697	9.6
Nickel Plate	5,919	11.6	4,327	8.8
Erie	4,929	9 6	5,426	11
C., C., C. & St. Louis	1,497	2.9	1,453	2.9
Totals	49,044	100.0	49,126	100.0